RAD
data communications

Installation and Operation Manual

Kilomux-2100/2104

Data, Voice, Fax and LAN Integrating Modular Multiplexer

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Installation and Operation Manual

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General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

Safety Symbols

Warning

This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

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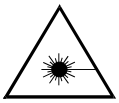
Protective earth: the marked lug or terminal should be connected to the building protective earth bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached. Please observe the following precautions:

- **Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.**
- **Do not attempt to adjust the laser drive current.**
- **Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.**
- **The use of optical devices with the equipment will increase eye hazard.**
- **Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.**

ATTENTION: The laser beam may be invisible!

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective earth terminal. If an earth lug is provided on the product, it should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Connection of AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

Connection of DC Mains

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC mains systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed form the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

Connection of Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status	
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV	Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1	Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2	Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3	Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The earthing and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk, there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution

To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention

Pour réduire les risques s'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good earth connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the earth bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching earth ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning	This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.
Avertissement	Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.
Achtung	Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkströrungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Conventions

Note	*A note draws attention to a general rule for a procedure, or to exceptions to a rule.*
Caution	A caution warns of possible damage to the equipment if a procedure is not followed correctly.
Warning	**A warning alerts to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the equipment. If these instructions are not followed exactly, possible bodily injury may occur.**

Declaration of Conformity

Manufacturer's Name: RAD Data Communications Ltd.

Manufacturer's Address: 24 Raoul Wallenberg St.
Tel Aviv 69719
Israel

declares that the product:

Product Name: **Kilomux-2100**

conforms to the following standard(s) or other normative document(s):

EMC:	EN 55022 (1994)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
	EN 50082 (1992)	Electromagnetic compatibility – Generic immunity standards for residential, commercial and light industry.
Safety:	EN 60950 (1992/93)	Safety of information technology equipment, including electrical business equipment.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The product was tested in a typical configuration.

Tel Aviv, March 23rd, 1998

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Otto-Hahn-Str. 28-30, 85521 Ottobrunn-Riemerling, Germany

Quick Start Guide

This Quick Start Guide is a brief step-by-step guide to setting up and using your Kilomux. It is a supplement to the *Kilomux Installation and Operation Manual*.

1. Installing Kilomux

To install Kilomux (for more detailed instructions refer to the *System Installation and Setup* chapter):

1. Unpack the equipment.
2. Check that your site conforms to the equipment requirements (refer to *Site Requirements* in the *System Installation and Setup* chapter).
3. Check the power supply rating considerations (refer *to Power Supply Rating Considerations* in the *System Installation and Setup* chapter).
4. Install the Kilomux enclosure (refer to *Installation and Setup* in the *System Installation and Setup* chapter).
5. Install an additional KPS module if necessary (refer to *Installation and Setup* in the *System Installation and Setup* chapter).
6. Install the KM-RINGER module (refer to *Installation and Setup* in the *System Installation and Setup* chapter).
7. Connect the power cable, the KM-RINGER module, the Supervisory Port (KCL.2 module), the KML module, option modules and I/O modules (refer to *Interfaces and Connections* in the *System Installation and Setup* chapter).
8. Set the IP address using the DEF AGENT (refer to *DEF AGENT* in the *Command Set Description* appendix).

2. Operating Kilomux

To operate Kilomux (for more detailed instructions refer to *Operating Instructions* in the *Operation* chapter):

1. If Kilomux-2100 includes a KM-RINGER module, set the KM-RINGER module power switch to OFF.
2. Turn on Kilomux by setting the ON/OFF switches (on the rear panels) to ON.
3. Check the front-panel indications (refer to *Operating Instructions* in the *Operation* chapter).
4. If Kilomux-2100 includes a KM-RINGER module, turn it on by setting its POWER switch to ON. Verify that the RING VOLTAGE and BATTERY VOLTAGE indicators light.

5. Check the Kilomux configuration (refer to *Checking Current Operating Configuration* in the *Operation* chapter).
6. Check the normal Kilomux operating indications (refer to *Normal Indications* in the *Operation* chapter).
7. Kilomux has diagnostic functions that can be used to test the proper operation of the Kilomux system and identify the faulty components. For an explanation of the Kilomux diagnostic functions refer to the *Diagnostics* chapter.
8. Turn off Kilomux as follows:
   - If Kilomux-2100 includes a KM-RINGER module, then turn off the KM-RINGER before Kilomux-2100.
   - For the Kilomux-2100's KPS modules and Kilomux-2104, set the ON/OFF switches (on the rear panels) to OFF.

3. Setting-Up the Local Configuration

To set-up the Kilomux local configuration (for more detailed information refer to *Setting Configuration Parameters* in the *Configuring Kilomux* chapter):

1. Set the system parameters refer to *Configuring the System Parameters* in the *Configuring Kilomux* chapter).
2. Select the main link parameters (refer to *Configuring the Main Link Parameters* in the *Configuring Kilomux* chapter).
3. Select the channel parameters (refer to *Configuring the Channel Parameters* in the *Configuring Kilomux* chapter).

4. Controlling Kilomux from a Supervisory Port

To control Kilomux from a supervisory port (for more detailed instructions refer to *Operating Instructions* in the *Operation* chapter):

1. Start a session for Kilomux (refer to *Starting a Session - Single Kilomux* and *Starting a Session - Multiple Kilomux* in the *Operation* chapter).
2. Type the desired commands after the working prompt and press Enter to execute the command. Refer to the *Command Set Description* appendix for a list of commands available.
3. End the control session by typing EXIT.

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Chapter 1
General Information

1.1 Functional Description

Kilomux is an advanced, highly versatile user-configurable modular TDM (Time Division Multiplex) system. Kilomux provides an efficient and cost-effective method for transmitting data, voice and fax over digital data services. Access to these services is provided over a variety of standard interfaces (V.35, RS-530/V.36, RS-232/V.24, X.21, Standard DDS, co-directional G.703, ISDN, fiber-optic, T1, E1 and IP), at data rates ranging from 9.6 to 1536 kbps. Bandwidth utilization efficiency is 98.5%.

Main System Features

The Kilomux system can be equipped with various types of input/output (I/O) modules that provide the required interface for the user data, fax, and voice channels. The range of available Kilomux modules is continuously expanding.

The series of I/O modules includes:

- High-speed synchronous data modules operating at a rate of 2.4 through 614.4 kbps – the KHS series of modules
- Low-speed data modules (300 bps to 57.6 kbps or 64 kbps) synchronous and asynchronous data channels, including statistical multiplexing modules – the KLS series of modules
- ISDN interface modules – the KHS.U series and KVF.4/S0 series
- 2W and 4W multiple voice channel interface modules that can directly connect to PBX lines and two-wire telephone sets – the KVC series of modules
- 2W and 4W interface voice/fax low bit rate KVF.4 and KVF.8 modules
- T1 and E1 PBX trunk interface KVF.5 and KVF.6 modules
- Token ring extender module, KTRE
- Ethernet Bridge/Router module, KMBE / KMBE/N
- Bypass and multidrop module, KDI – for Kilomux-2100 only.

Detailed information on the specific Kilomux modules can be found in the separate module Installation and Operation Manuals.

Figure 1-1 illustrates the basic capabilities of the Kilomux-2100 system.

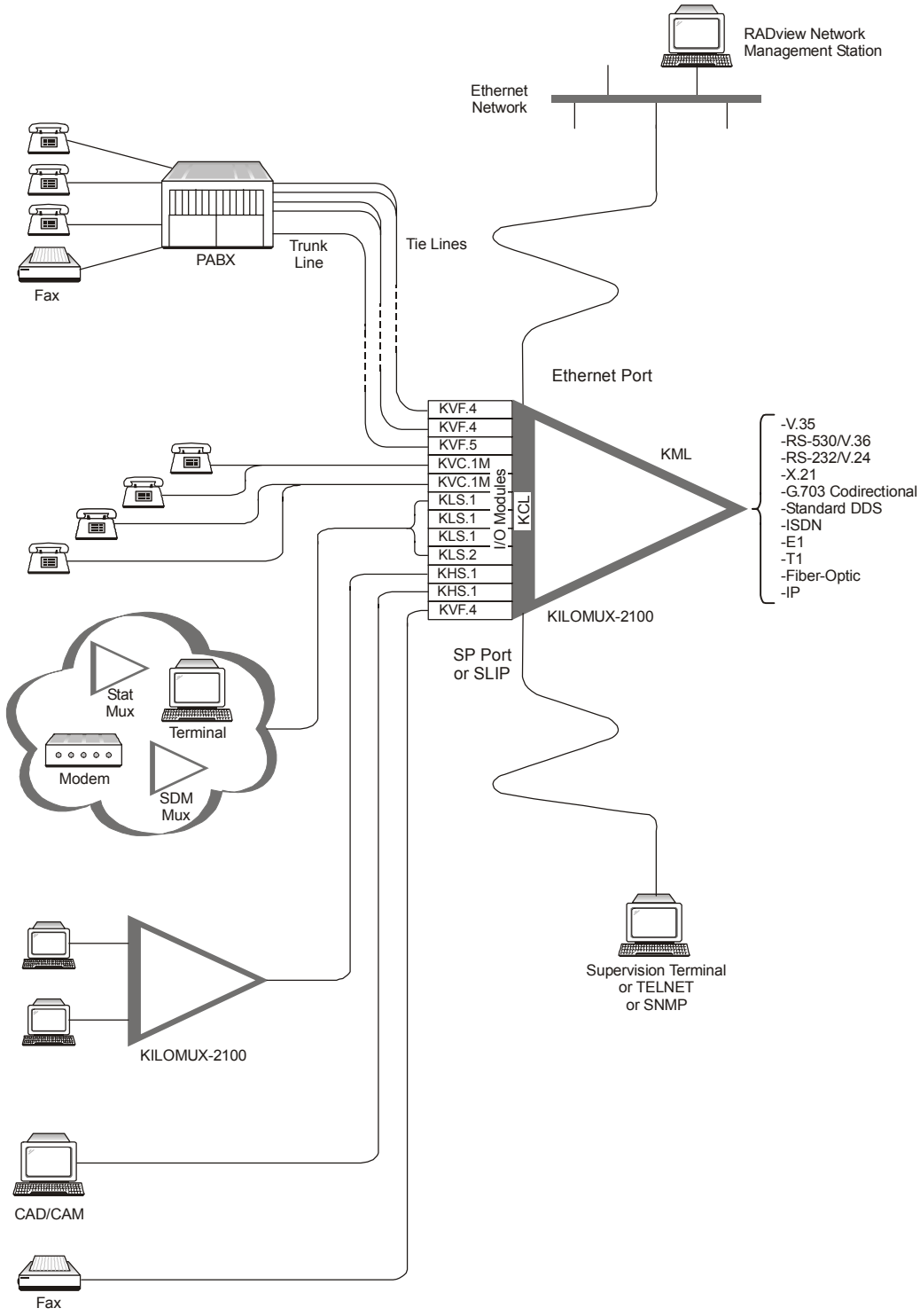


Figure 1-1. Kilomux-2100 System Applications

The Kilomux-2104 system is equipped with only one main link. The Kilomux-2100 system can be equipped with two main link modules. The two main link modules, found only in the Kilomux-2100 system, can be used in several ways:

- To provide hot-standby redundancy (backup) for the main link, with automatic or manual switchover in case one of the links fails. For maximum flexibility, Kilomux-2100 allows the preparation of a different configuration for use on the backup link. The backup link can also use a switched data circuit. The switched circuit can be established on a PSTN line, using analog modems, or on an ISDN line using an S or U interface.
- To provide two independent links from the same Kilomux-2100 enclosure. The two links can operate at different data rates. The dual-link mode can also be used for providing the equivalent of hot standby protection to critical data channels (by enabling the priority bumping feature).
- To provide multidrop and bypass capabilities (using a dedicated KDI module).

In addition to main link redundancy, the Kilomux-2100 system reliability can be further enhanced by installing an additional power supply unit in the enclosure. The power supplies share the load current; therefore when one of them fails or its input voltage is disconnected, the other takes over the full load without disturbance to Kilomux-2100 operation.

The Kilomux system provides flexible system timing options, with several main link, and channel timing modes.

The main link timing modes are DTE, DCE, adaptive, and external DCE. In the DCE and external DCE modes, the timing reference source can be selected by the user:

- Internal oscillator
- External (timing locked to one of the data channels)
- The other main link module (provided a KDI module is installed).

In addition to the main timing source, a fallback source can be selected. When the timing mode is DTE or external DCE, buffers are inserted in the main link signal paths, to absorb the expected jitter and timing instabilities. Normal buffer size is ±8 bits for operation over satellite links. The receive buffer size can be increased to ±256 bits.

The timing modes available for the data channels are programmable, thereby permitting each channel to be configured as DCE (supplies receive and transmit clocks to the user's equipment), DTE1 (supplies the receive clock and accept a transmit clock), or DTE2 (accepts receive and transmit clocks from the user's equipment), with buffered retiming of the received data. Connection to the national network and to common-carrier data lines is also supported, with the external clock selectable as the source for system timing.

For modules with ISDN, T1, E1, and fiber-optic interfaces, a loopback timing mode is available. This mode enables locking the Kilomux timing to the accurate timing provided by the network to which the interface is connected.

For modules with IP interfaces, an adaptive timing mode is available. This mode enables to recover clock from the Ethernet network interface.

System Supervision and Configuration

The Kilomux system is designed for unattended operation. A complete collection of operating parameters configures the Kilomux system and each of its modules. This collection of operating parameters is determined by a database. This database is stored in the non-volatile memory of the Kilomux control module. Kilomux can store in two different databases, a primary database and a backup database, and can be configured to switch automatically between the databases, in accordance with a predetermined daily schedule ("day/night" operation), or to use one of the databases only in case of switching to a backup link.

Note *Switching of the Kilomux to the backup database is enabled only when the Kilomux operates in* ***switched backup*** *mode.*

Kilomux stores alarms detected during operation in a buffer. The buffer stores alarms to be sent to a supervision terminal and can hold up to 100 alarms. During regular operation, a front panel indicator lights to indicate if there are any alarms in the alarm buffer. The local operator can then review the contents of the alarm buffer, and can delete old alarms related to events that are no longer present in the system.

In addition to the alarm buffer, the front-panel LED indicators display in real time the main link and power supply status and alert when test loops are present in the system. The front panel LED indicators can also be used to monitor on-line a selected user channel. The monitored functions are transmit data and receive data activities, and the state of the RTS and DCD control lines (or E and M lines for voice channels).

Local Kilomux Management

A local Kilomux can be managed by any of the following:

- ASCII terminal connection to the local Kilomux
- TELNET connection to the local Kilomux. The connection can be via SLIP or via an Ethernet LAN. The local Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.
- RADview network management station connected to the local Kilomux. The connection can be via SLIP or via an Ethernet LAN. The local Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.

Remote Kilomux Management

A remote Kilomux can be managed either in-band or out-of-band. For both, the remote Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.

In-Band Management

In-band management of a remote Kilomux is performed via the local Kilomux and the data frame. A connection to the local Kilomux can be made through:

- An Ethernet LAN
- A SLIP connection.

In both cases, management can be performed via TELNET or RADview. Some of the bandwidth of the main link between the two Kilomuxes is used to relay the management information.

In a "V" configuration, any one of the three Kilomuxes can be considered the local Kilomux. The other two Kilomuxes can be managed through the local Kilomux.

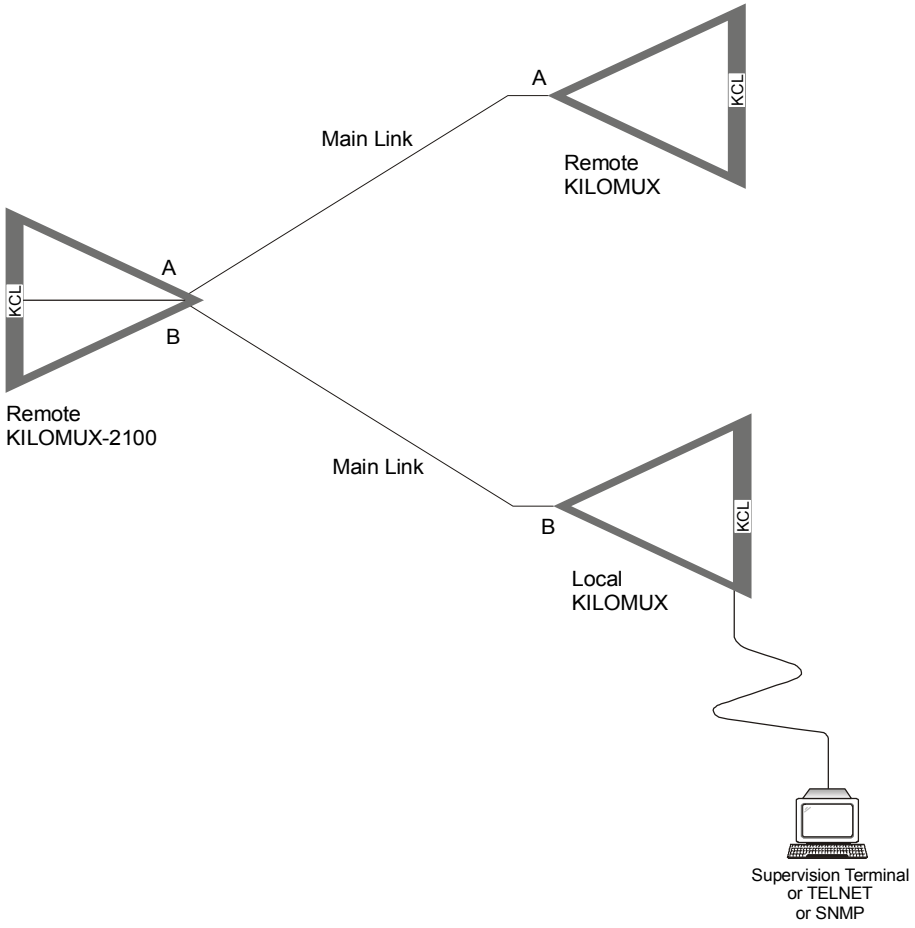


Figure 1-2. "V" Configuration

The main link between the local Kilomux and the remote Kilomux can also be used to download software.

Out-of-Band Management

There are several options for managing a remote Kilomux out-of-band:

- Using a RADview network management station or TELNET over a LAN connected to the remote Kilomux. The remote Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.

- Using a RADview network management station or TELNET via a SLIP connection to the remote Kilomux. The remote Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.
- Using an ASCII terminal via a modem connection to the SP port.

Diagnostic Capabilities

The Kilomux system provides extensive diagnostics, supervision and maintenance capabilities for easy maintenance and rapid detection and location of faults.

Kilomux diagnostics include automatic self-test upon power-up, and on-line monitoring of critical functions. The system generates time stamped alarm messages that cover all the significant system events. The time stamp is provided by a real-time clock with battery backup. The system operator can then perform comprehensive testing on each type of module, to determine the cause of the alarm messages and return the system to normal operation.

Various types of test loops are provided, including modem loops 2 and 3 per ITU-T Rec. V.54 for rapid isolation of the fault area, tone injection for rapid testing of voice interface modules, and pseudo-random sequence transmission test for checking the proper operation of data interface modules, and detection of bit errors.

1.2 Physical Description

Kilomux-2100, General Description

The Kilomux-2100 system consists of a 19" (3U) enclosure that contains 18 module slots. Five of the slots (slots 1 through 5) are assigned to the system modules:

- The control subsystem
- The main link (aggregate) interface subsystem
- The system power supplies.

Two slots each are assigned for KML and KPS modules, respectively, to provide support for the redundancy option:

- Slots 1 and 2 - for KPS modules
- Slots 3 and 4 - for KML modules.

One slot (slot 6) is assigned for an options module (e.g., for the KDI or KAI modules). The other 12 slots are intended for I/O modules. Each I/O slot can accept any type of I/O module. All the modules are inserted through the rear panel. The cable connections are also made through the rear panel.

Figure 1-3 shows a general view of a Kilomux-2100, and identifies the functions of the enclosure slot.

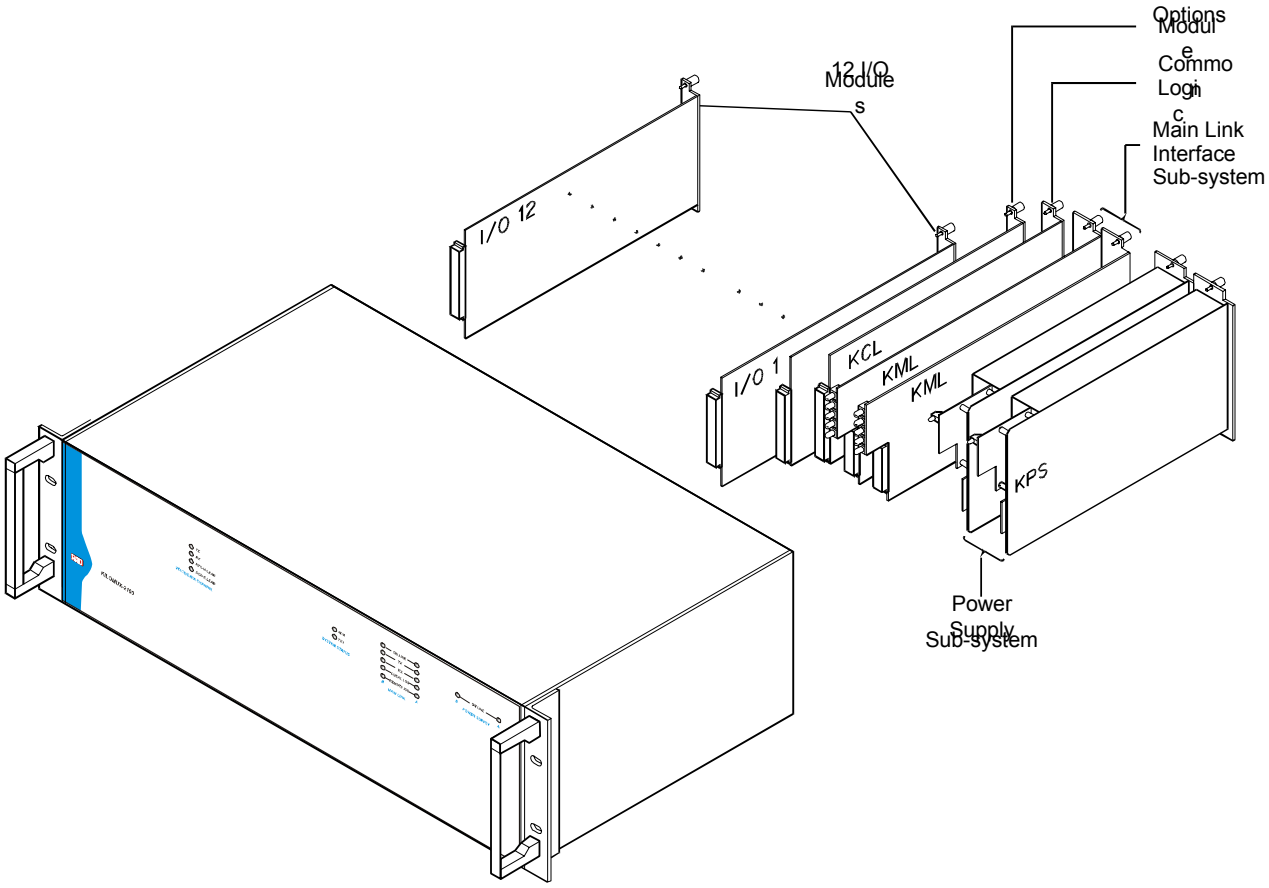


Figure 1-3. Kilomux-2100 Enclosure with Modules, General View

Kilomux-2100 Rear Panel

Figure 1-4 shows a typical rear panel of the Kilomux-2100 enclosure and identifies the slots and their use.

Note the labels which designate the type of module that can be installed in each slot; in addition, each slot is keyed; therefore it is not possible to install the wrong module type.

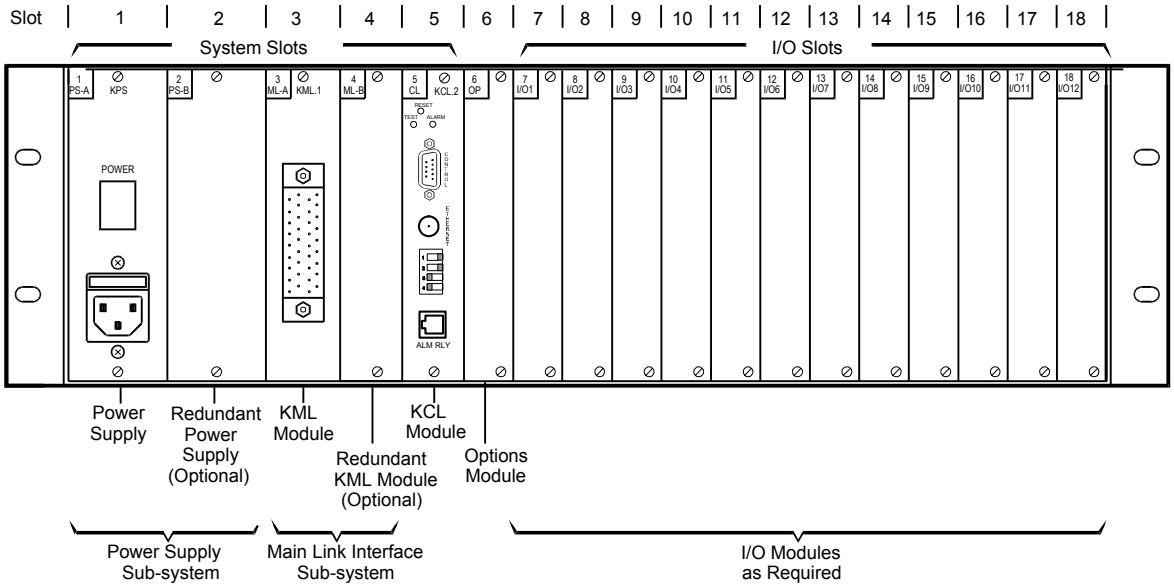


Figure 1-4. Kilomux-2100 Enclosure, Rear View

Kilomux-2100 Front Panel

The front panel of the Kilomux-2100 enclosure includes labels for the show-through areas for the status indicators located on each system module. Note that the indicators are arranged in groups (one group for each system module), which are positioned before the corresponding module slot.

Figure 1-5 shows the front panel of the Kilomux-2100 enclosure. Refer to the *Operation* chapter for a description of the front panel functions.

Figure 1-5. Kilomux-2100 Front Panel

Kilomux-2104, General Description

The Kilomux-2104 system consists of a 19" 1U enclosure with 4 slots for the installation of I/O modules. All the modules are inserted through the rear panel. The cable connections are also made through the rear panel. The front panel includes an information section of status and alarm indicators.

The following figure shows a general view of a Kilomux-2104 enclosure.

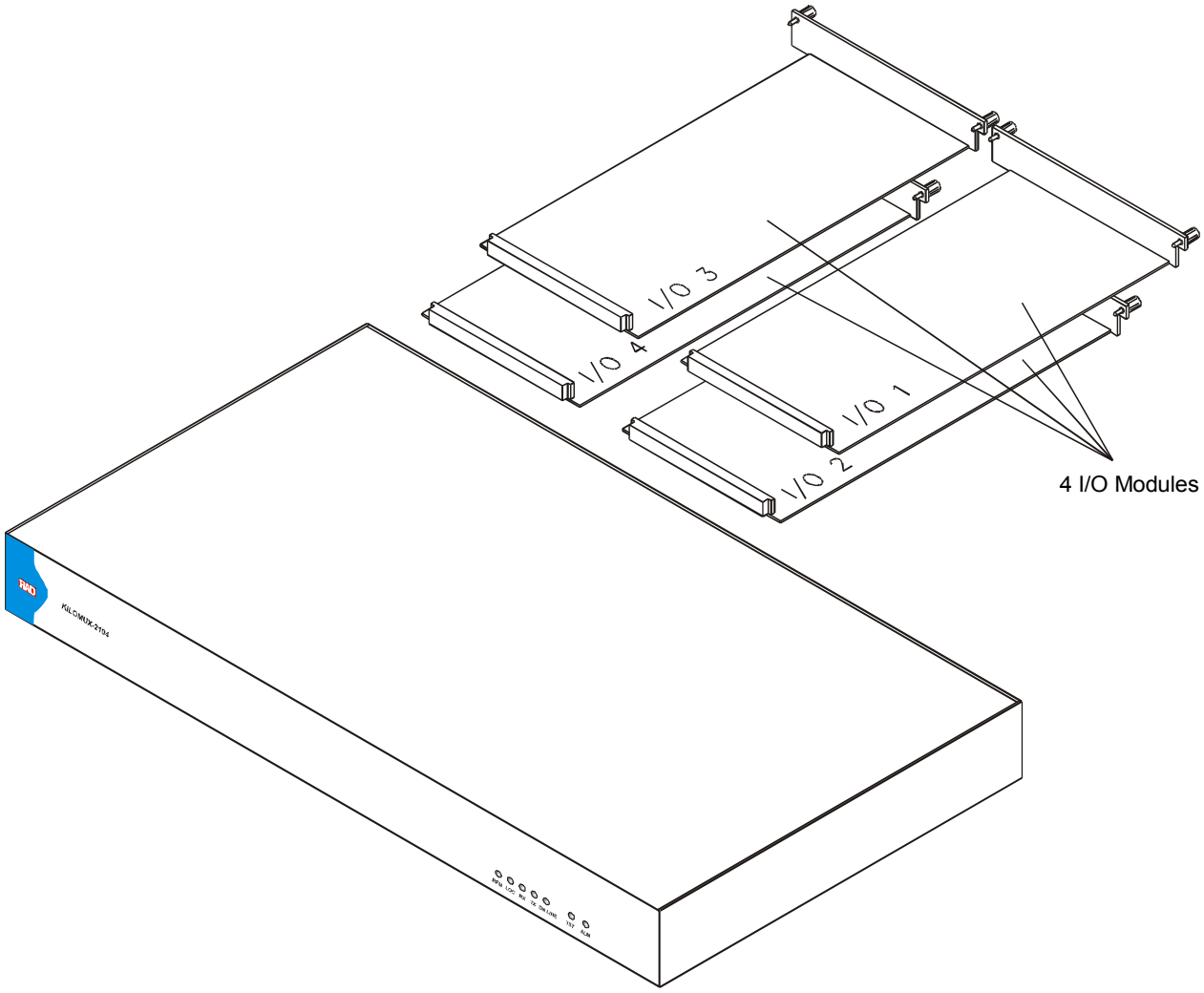


Figure 1-6 Kilomux-2104 Enclosure, General View

The Kilomux-2104 enclosure contains the control sub-system, the main link (aggregate) sub-system and the system power supply.

The main link sub-system performs main link interfacing, multiplexing and demultiplexing functions, and provides the timing signals used by the I/O modules installed in the enclosure.

Kilomux-2104 Rear Panel

The following figure shows a typical rear view of the Kilomux-2104 enclosure and identifies the I/O slots.

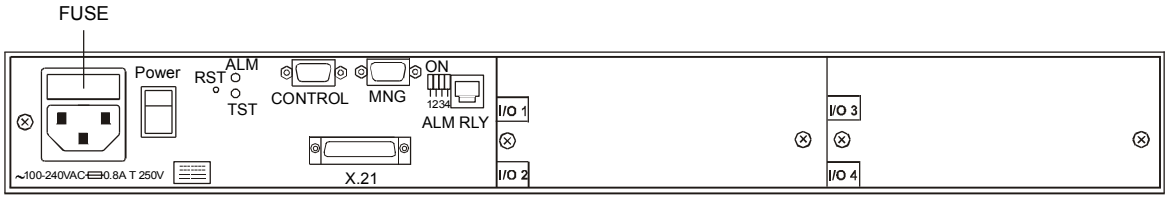


Figure 1-7. Kilomux-2104 Enclosure, Rear View

Kilomux-2104 Front Panel

The following figure shows the front panel of the Kilomux-2104 enclosure. The front panel includes status indicators. Refer to the *Operation* chapter for a description of the front panel functions.

Figure 1-8. Kilomux-2104 Enclosure Front Panel

Common Logic Modules

The Kilomux enclosure requires one KCL.2 type common logic module. The main functions of the KCL.2 module are control of:

- Multiplexing/demultiplexing operations
- System management
- Interfacing with the optional external system management.

The KCL.2 module stores the Kilomux database in non-volatile memory (NVRAM). The configuration information stored in the NVRAM is downloaded to the module installed in Kilomux upon turn-on or after system reset. Therefore, during troubleshooting activities, it is possible to temporarily remove the KCL.2 module from the Kilomux-2100 enclosure without disrupting system operation. If it is necessary to replace the KCL.2 module, the database can be transferred to a new module by installing the NVRAM taken from the original module in the replacement module.

Main Link Modules

The Kilomux enclosure can accept one KML type main link interface module or, for Kilomux-2100, two KML type main link interface modules. In addition to main link interfacing, the KML module performs the multiplexing and demultiplexing functions and provides the timing signals used by the other modules installed in the enclosure. Two KML modules are necessary for dual link configurations and for main link redundancy.

The following main link interface modules are available:

KML.1 - V.35 main link interface module

KML.2 - V.24/RS-232 main link interface module

KML.3 - V.36/RS-422/RS-530 main link interface module

KML.4 - X.21 main link interface module

KML.5 - G.703 co-directional main link interface module

KML.6 - Standard DDS CSU/DSU main link interface module

KML.7 - T1 main link interface module

KML.8 - E1 main link interface module.

KML.10 - ISDN main link interface module. The module can be ordered in two versions:

- KML.10/S with ISDN S-type interface. The "S" interface operates as Terminal Adapter (TE side), intended for connection to standard Network Termination (NT) unit.
- KML.10/U with ISDN U-type interface. The "U" interface operates as Network Termination (NT side) unit, intended for connection to standard Line Termination (LT) unit.

KML.11 - Main link over IP interface module. The module can be ordered with in two types of Ethernet port:

- **UTP** for 10/100BaseT interface with an RJ-45 connector.
- **MMLC** for 100BaseF multimode fiber optic interface with an LC connector.

KML.F - Fiber-optic main link interface module. The module can be with various types of optical interfaces (laser or LED transmitters for single-mode and multi-mode fiber-optic cable).

For more information, see each main link module's *Installation and Operation Manual*.

Power Supply Modules

The Kilomux-2100 enclosure can accept one or two KPS type power supply modules. Several types of power supply modules are available:

KPS.3 - 25W power supply module for -48 VDC power

KPS.4 - 50W power supply module for 100 to 240 VAC mains

KPS.5 - 25W power supply module for -24 VDC power

KPS.6 - 56W power supply module for 100 to 240 VAC mains

KPS.7 - 56W power supply module for -48 VDC mains

KPS.8 - 130W power supply module for -100 to 240 VAC mains.

Two KPS modules are necessary for redundancy: when both modules are operational, they share the load, whereas in case of failure or loss of input power the remaining module continues to supply the power alone and there is no redundancy. Switch-over is automatic and does not disturb normal operation.

The Kilomux-2104 enclosure includes one power supply. The available types are:

- **AC** - 30W power supply for 100 to 240 VAC mains
- **48** - 40W power supply for –48 VDC mains
- **24** - 40W power supply for –24 VDC mains.

In addition to power supply modules, the Kilomux-2100 enclosure supports one KM-Ringer module, for providing line feed and ring voltages for voice channels and phantom feed for ISDN lines. This module is available in AC (115 to 230 VAC) and DC (-24 VDC or -48 VDC) input voltage versions. The KM-Ringer can be installed as a plug-in module for Kilomux-2100, or located on shelves or desktops.

Option Modules - Kilomux-2100 Only

The Kilomux-2100 enclosure can accept two types of options module:

KAI - Kilomux-2100 only
Alarm indication module for installation in the options position, or in any I/O slot. The KAI includes indicators similar to those located on the Kilomux-2100 front panel. These indicators repeat all the relevant Kilomux-2100 front panel indications on the rear panel, and thus complement the indicators available on the rear panels of the other modules. Maintenance activities are thus expedited, as all the Kilomux-2100 indications become readily available on one side of the equipment.

KDI - Kilomux-2100 only
Bypass and multidrop module. The KDI module can be installed in the option slot, or in any I/O slot. The KDI module enables direct transfer (bypassing) of a group of main link frame bits, in both directions, between the two main links of Kilomux-2100. Channels that are not bypassed are connected to I/O modules of Kilomux-2100.

The KDI module is available in two versions:

- KDI version: supports only the bypassing function
- KDI/M version: also includes a data channel interface for one multidrop channel. The multidrop channel is compatible with the data channels of the KLS.1/NEW low-speed data module, and supports data rates in the range of 0.3 to 64 kbps. As is standard practice in a multidrop application, the receive path of the local multidrop channel continuously receives the data transferred in its allocated bandwidth on the desired main link (the same data is also bypassed to the other link, to make it available downstream), but its transmit path is connected to the main link only when the RTS line in the local interface is asserted.

For more information, see the option module's *Installation and Operation Manual*.

I/O Modules

Kilomux-2100 supports up to 12 user-selected I/O modules. Kilomux-2104 supports up to 4 user-selected I/O modules. Kilomux can accept any combination of the following types of I/O modules with power supply limitations.

- **KVC.1** - ADPCM or PCM voice interface module, provides two voice channels. For more information, refer to the *KVC.1 Installation and Operation Manual*. The following versions are available:
  - KVC.1/E&M: four-wire or two-wire interface with E&M signaling per RS-464 Types I, II, III and V, and British Telecom SSDC5
  - KVC.1/FXS: two-wire interface for direct connection to a telephone set
  - KVC.1/FXO: two-wire interface for direct connection to a PBX extension line.

Note *KVC.1 module is not supported in main link rates higher than 384 kbps.*

- **KVC.1M** - ADPCM or PCM voice interface module, provides one or two voice channels and support error-free fax transmission. For more information, refer to the *KVC.1M Installation and Operation Manual*.
  The following versions are available:
  - KVC.1M/E&M: two voice channel with four-wire or two-wire interface with E&M signaling per RS-464 Types I, II, III and V, and British Telecom SSDC5
  - KVC.1M/E&M48: similar to the KVC.1M/E&M, except that it requires an external -48 VDC source to supply the signaling voltage for increasing the maximum allowed line length
  - KVC.1M/FXS: two voice channels with two-wire interface for direct connection to a telephone set
  - KVC.1M/FXSP: similar to KVC.1M/FXS, except that it has an internal ringer and line feed supply
  - KVC.1M/FXO: two voice channels with two-wire interface and FXO loop start signaling for direct connection to a PBX extension line.
- **KVC.3** - Low-bit rate voice module, provides two high-quality compressed voice channels. For more information, refer to the *KVC.3 Installation and Operation Manual*.
  The following versions are available:
  - KVC.3/E&M: two voice channels with four-wire or two-wire interface with E&M signaling per RS-464 Types I, II, III and V, and British Telecom SSDC5
  - KVC.3/FXS: two voice channels with two-wire interface for direct connection to a telephone set
  - KVC.3/FXSP: similar to KVC.3/FXS, except that it has an internal ringer and line feed supply
  - KVC.3/FXO: two voice channels with two-wire interface and FXO loop start signaling for direct connection to a PBX extension line.
- **KLS.1** - Low-speed RS-232 data module. For more information, refer to the *KLS.1 Installation and Operation Manual*.
- **KLS.2** - Low-speed RS-232 four-channel asynchronous statistical data module. For more information, refer to the *KLS.2 Installation and Operation Manual*.
- **KHS.1** - High-speed data interface module, provides two high-speed V.35, RS-530 or RS-449/RS-422 data channels. For more information, refer to the *KHS.1 Installation and Operation Manual*.
- **KHS.2** - Two-channel synchronous data module. For more information, refer to the *KHS.2 Installation and Operation Manual*.

- **KHS.U** - Data interface module, provides one or two ISDN basic access rate type "U" interfaces. The KHS.U module enables the extension of ISDN lines over non-ISDN facilities. For more information, refer to the *KHS.U Installation and Operation Manual*.
  The following versions are available:
  - KHS.U/S with one "U" interface
  - KHS.U/D with two "U" interfaces.
- **KHS.703** – High-speed data module that provides two independent 64 kbps co-directional data channels per ITU-T Rec. G.703. Each module is terminated with an RJ-45 eight-pin connector. For more information, refer to the KHS.703 Installation and Operation Guide, further on in this manual.
- **KVF.4** - Voice/fax relay module using advanced digital signal processing (DSP) techniques (MPMLQ in accordance with ITU-T Rec. G.723.1) to provide one or two channels for transmission of voice and standard Group III fax signals over the Kilomux link with automatic switch-over between voice and fax modes. For more information, refer to the *KVF.4 Installation and Operation Manual*.
  The following versions are available:
  - KVF.4/E&M: two channels with four-wire or two-wire interface with E&M signaling per RS-464 Types I, II, III and V, and British Telecom SSDC5
  - KVF.4/E&M/E: similar to the KVF.4/E&M, except that it requires an external -48 VDC source to supply the signaling voltage for increasing the maximum allowed line length
  - KVF.4/FXS: two voice channels with two-wire interface for direct connection to a telephone set
  - KVF.4/FXS3: similar to KVF.4/FXS, except that it supports pulse metering and polarity reversal
  - KVF.4/FXSP: similar to KVF.4/FXS, except that it has an internal ringer and line feed supply
  - KVF.4/FXSW: one channel similar to the channels of the KVF.4/FXS, and one two-wire interface operating with FXO signaling, intended for connection to the PSTN, or to a PBX extension line
  - KVF.4/FXO: two channels with two-wire interface and FXO loop start signaling for direct connection to a PBX extension line
  - KVF.4/FXO3: similar to KVF.4/FXO, except that it supports pulse metering and polarity reversal
  - KVF.4/S0: one ISDN basic rate access type "S" interface for direct connection to an ISDN PBX.

- **KVF.5** - Voice/fax relay module with T1 or E1 PBX trunk interface, uses advanced digital signal processing (DSP) techniques (MPMLQ – Multi-pulse Maximum Likelihood Quantization in accordance with ITU-T Rec. G.723.1) to allow the transmission of Group III facsimile and high-quality compressed voice signals while requiring, for each channel, a bandwidth of only 4.8, 6.4, 7.2, 9.6, or 12.8 kbps on the Kilomux main link. For more information, refer to the *KVF.5 Installation and Operation Manual*.
  The following versions are available:
  - KVF.5/T1/M: KVF.5 "master" module with balanced T1 sub link interface, for connection to PBXs
  - KVF.5/E1/M: KVF.5 "master" module with balanced and unbalanced E1 sub link interfaces, for connection to PBXs
  - KVF.5/T1/S: basic KVF.5 "slave" module without trunk interface
  - KVF.5/E1/S: basic KVF.5 "slave" module without trunk interface.
- **KVF.6** - Voice/fax compression module, provides direct connection to E1/T1 PBX trunks. For more information, refer to the *Installation and Operation Manual*.
- **KVF.8** – Provides high quality digital compression of eight analog voice/fax channels. For more information, refer to the *KVF.8 Installation and Operation Manual*.
- **KTRE** - Token ring extender module. For more information, refer to the *KTRE Installation and Operation Manual*.
- **KMBE** - Ethernet Bridge/Router module. For more information, refer to the *KMBE Installation and Operation Manual*.
- **KMBE/N** – Two channel Ethernet bridge/router module. For more information refer to the *KMBE/N Installation and Operation Manual*.

1.3 Application Considerations

Basic Kilomux System

Basic System Structure

The basic Kilomux system consists of two Kilomux units connected by a single link, as shown in *Figure 1-9*.

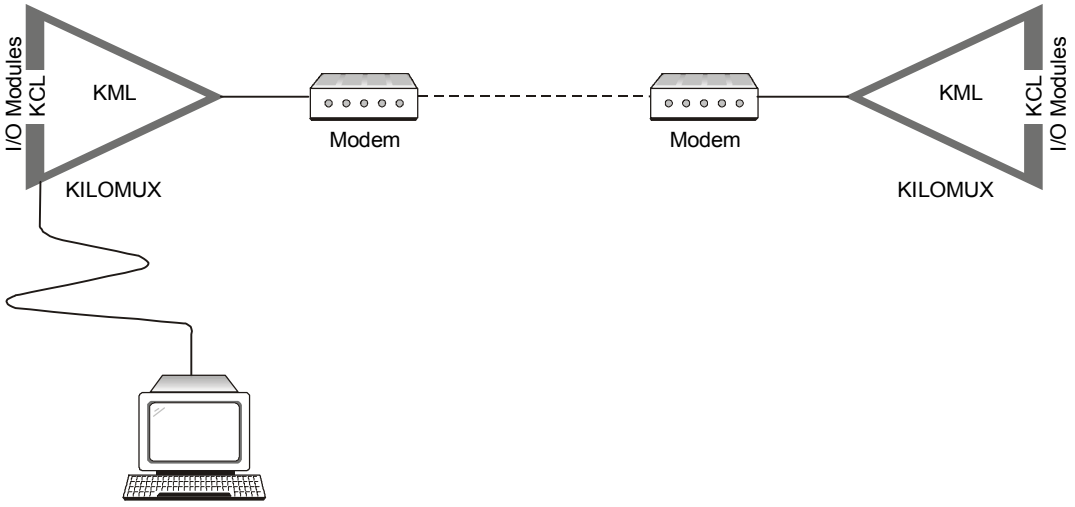


Figure 1-9. Basic Kilomux System Structure

System Multiplexing Capabilities

To provide the flexibility necessary to support up to 12 I/O modules of various types for the Kilomux-2100 or up to 4 I/O modules of various types for the Kilomux-2104, with each module capable of operation in several modes, the Kilomux system uses permanent on-demand allocation of main link bandwidth. This means that bandwidth is permanently allocated to the active channels of each module when the module is inserted into the Kilomux enclosure, and the allocation is made in accordance with the selected data rate and the end-to-end signaling requirements of each channel. The main link bandwidth is dynamically reallocated when a change occurs in the number of modules or the number of active module channels, or when the operating mode of the main link or the operating mode of the modules is changed. For special applications, the user can disable the automatic allocation and perform manual allocation.

Although in general, dynamic on-demand bandwidth allocation requires that the link is resynchronized after each change in allocation, the allocation algorithm used by Kilomux has been optimally designed so that it does not require resynchronization. It only requires reallocation of time slots, thereby reducing the disruption to other channels when the bandwidth required by a module or a module channel changes. In many cases, the required changes are made even without time slot reallocation: for example, disconnecting or reducing the data rate carried by a channel never requires reallocation.

Bandwidth allocation is performed by organizing the data in frames. Frame length varies with the main link data rate, as listed in *Table 1-1*.

Note *If you are using automatic frame allocation, special precautions must be taken to ensure proper operation of the link:*

In general, the two Kilomux units must be identically equipped. Both units must include the same modules with the following exceptions:

- *The KLS.1 in the local Kilomux unit can work with the KLS.2 in the remote Kilomux unit.*
- *The KVF.4 in the local Kilomux unit can work with the KVF.5 in the remote Kilomux unit.*
- *The KMBE in the local Kilomux unit can work with the KHS.2 in the remote Kilomux unit.*
- *The KVF.6 in the local Kilomux unit can work with the KVF.8 in the remote Kilomux unit.*

The order of the modules must be the same in both units, and their connections to main link modules must be the same.

The modules and module channels installed in the two Kilomux units must be identically configured, except for parameters that control local interfacing characteristics, such as the channel interface type, the timing modes, etc.

After each change of configuration that affects the bandwidth utilization, e.g., addition of a new channel, selection of a mode that requires end-to-end signaling, etc., perform the REBUILD FRAME command on both Kilomux units.

Table 1-1. Kilomux Multiplexing Data

Main Link Rate	Frame Length	Bandwidth Allocation Unit	Bandwidth Available to User
9.6 kbps	24 bits	0.4 kbps	9.2 kbps (23 units)
14.4 kbps	36 bits	0.4 kbps	14.0 kbps (35 units)
19.2 kbps	48 bits	0.4 kbps	18.8 kbps (47 units)
28.8 kbps	72 bits	0.4 kbps	28.4 kbps (71 units)
32 kbps	80 bits	0.4 kbps	31.6 kbps (79 units)
48 kbps	60 bits	0.8 kbps	47.2 kbps (59 units)
56 kbps	70 bits	0.8 kbps	55.2 kbps (69 units)
64 kbps	80 bits	0.8 kbps	63.2 kbps (79 units)
128 kbps	160 bits	0.8 kbps	127.2 kbps (159 units)
192 kbps	240 bits	0.8 kbps	191.2 kbps (239 units)
256 kbps	160 bits	1.6 kbps	254.4 kbps (159 units)
384 kbps	240 bits	1.6 kbps	382.4 kbps (239 units)
512 kbps	160 bits	3.2 kbps	508.8 kbps (159 units)
768 kbps	240 bits	3.2 kbps	764.8 kbps (239 units)
1024 kbps	160 bits	6.4 kbps	1017.6 kbps (159 units)
1536 kbps	240 bits	6.4 kbps	1529.6 kbps (239 units)

The allocation of bandwidth is performed in distinct units. The bandwidth allocation unit (BAU) is 0.4, 0.8, 1.6, 3.2 or 6.4 kbps, in accordance with the main link data rate (see *Table 1-1*).

Bandwidth allocations must be made for the following uses:

- Kilomux frame synchronization
- In-band management channel. This channel's main function is to allow a connection to be made to the remote unit by TELNET, RADview management or TFTP via the download bandwidth allocation. Through in-band management, some of the bandwidth of the main link between the local Kilomux and the remote Kilomux is used to relay management information.
- Channel data
- Channel end-to-end signaling.

The following table provides bandwidth allocation information. The use of the information presented in the table to calculate the bandwidth required for various operating configurations is illustrated by a numerical example that follows the table.

Table 1-2. Bandwidth Allocations

Use	Allocation Units						Allocation Rule
Frame Synchronization	1						Mandatory
Management Channel	*Depends on Main Link Rate*						Optional (at least 9.6 kbps recommended)
Channel Data	Channel	Main Link Rate in kbps (used Bandwidth Allocation Unit kbps rate in parenthesis)					
		9.6 to 32 (0.4)	48 to 192 (0.8)	256, 384 (1.6)	512, 768 (3.2)	1024, 1536 (6.4)	
All Modules	300 bps	3	3	3	3	–	In accordance with channel data rate. Theoretical minimum is 1 allocation unit per active channel. For low rate data (i.e., for data rates lower than the bandwidth allocation unit), oversampling is used to achieve an integer number of bit samples, e.g., when the bandwidth allocation unit is 0.8 kbps and the channel data rate is 300 bps, the effective bandwidth used is 8 times higher, 2.4 kbps. 2.4 kbps translate to 3 allocation units. Therefore, the effect of oversampling is to increase the bandwidth used to transfer low-rate channels.
	600 bps	3	3	3	3	–	
	1.2 kbps	3	3	3	3	–	
	2.4 kbps	6	3	3	3	–	
	4.8 kbps	12	6	3	3	–	
	6.4 kbps	16	8	4	2	–	
	7.2 kbps	18	9	–	–	–	
	8 kbps	20	10	5	–	–	
	9.6 kbps	24	12	6	3	–	
	14.4 kbps	36	18	9	–	–	
	16 kbps	40	20	10	5	–	
	19.2 kbps	48	24	12	6	3	
	24 kbps	60	30	15	–	–	
	28.8 kbps	72	36	18	9	–	
	32 kbps	80	40	20	10	5	
	38.4 kbps	–	48	24	12	6	
	48 kbps	–	60	30	15	–	
	56 kbps	–	70	35	N/A	–	
	57.6 kbps	–	72	36	18	9	
	64 kbps	–	80	40	20	10	
	67.2 kbps	–	84	42	21	–	
	76.8 kbps	–	96	48	24	12	
	86.4 kbps	–	108	54	27	–	
	96.0 kbps	–	120	60	30	15	
	105.6 kbps	–	132	66	33	–	
	115.2 kbps	–	144	72	36	18	
	124.8 kbps	–	156	78	39	–	
	128 kbps	–	–	80	40	20	
	160 kbps	–	–	100	50	25	
	192 kbps	–	–	120	60	30	
	224 kbps	–	–	140	70	35	
	240 kbps	–	–	150	75	–	64 kbps rate available only for main link rates of 128 kbps and higher
	272 kbps	–	–	170	85	–	
	304 kbps	–	–	190	95	–	
	336 kbps	–	–	210	105	–	
	368 kbps	–	–	230	115	–	
KHS.2 Only	N × 2.4	N × 6	N × 3	–	–		
	N × 4.8	–	–	N × 3	–		
	N × 9.6	–	–	–	N × 3		
Channel End-to-End Control Signals	1 allocation unit per module or for each two channels of the same module, when applicable (1 allocation unit can carry up to four control signals, e.g., two signals for two channels)					For each channel that requires end-to-end signaling, including voice channels	

Note *Modules which transmit the signaling information in-band, e.g., KVF.1 and KVC.2, do not require bandwidth allocation for channel end-to-end signaling.*

Bandwidth Allocation Example

A Kilomux-2100 enclosure equipped as follows is connected to a 256 kbps link (BAU used with this link rate is 1.6 kbps). The following table lists the required bandwidth allocation.

Table 1-3. Example of Bandwidth Allocations

Modules Installed in Enclosure	Allocation Units
Five KLS.1 with 4.8 kbps per channel (total of 10 channels); seven channels (distributed among four modules) require end-to-end signaling	30 units 4 units signaling
Two KLS.1 with 9.6 kbps per channel (total of 4 channels), no end-to-end signaling	24 units
One KLS.2 with composite data rate of 19.2 kbps	12 units
One KHS.1 with 64 kbps per channel, no end-to-end signaling	40 units
One KVC.1 module at 32 kbps per channel	40 units 1 unit signaling
Total user allocation Frame synchronization Management channel (9.6 kbps)	151 units 1 units 6 units
Total capacity used	**158 units**
Reserve capacity	2 units (3.2 kbps)

Redundancy - Kilomux-2100 Only

The minimum Kilomux-2100 system configuration requires only one KPS module, one KCL module and one KML module. For critical applications, system availability can be increased by installing redundant modules in the enclosure.

The redundancy capability is available for two critical functions: the main link and the power supply. A failure in either one of these functions, e.g., because of link failure or loss of power, could disable the whole system. However, a failure in an I/O module affects only a small part of the system, and can generally be overcome by using alternate routes, putting unused capacity into service, etc.

The Kilomux-2100 system is designed to automatically put a redundant module in service in case the corresponding module fails, thereby ensuring continuous system operation in the event of any single module failure. Moreover, redundant modules may be inserted or removed even while the system operates, without disrupting the traffic or degrading the system performance.

The utilization of the redundant modules is explained in the following section.

KPS Module Redundancy

The KPS module supplies the operating voltages to Kilomux-2100. A single KPS module can provide the full power requirements of an enclosure. However, a second KPS module may be added. With a redundant KPS module, both modules are connected to power and share the load when the system is operating. If one module (or its power source) fails, the second module automatically takes up the full load and there is no redundancy.

To maximize the protection conferred by the use of redundant power supply modules, observe the following recommendations:

- Whenever possible, connect each of the two KPS modules to a different power circuit. Thus, if the circuit breaker that protects one of the power circuits trips, the other module continues to receive power.
- If -48 VDC battery backup is available, install one DC-powered KPS.3 module and one AC-powered module. Make sure to select power supply modules with comparable ratings, e.g., KPS.6 and KPS.7.

KML Module Redundancy

The KML module serves as the connecting link between the Kilomux-2100 unit and the communication channel. For extra protection, a second KML module, may be installed in parallel to the primary KML module. The two KML modules are then connected through two independent links, which may even follow different paths, to two similar modules located at the remote end of the link. In the switched backup mode, the two links can be operated at different data rates.

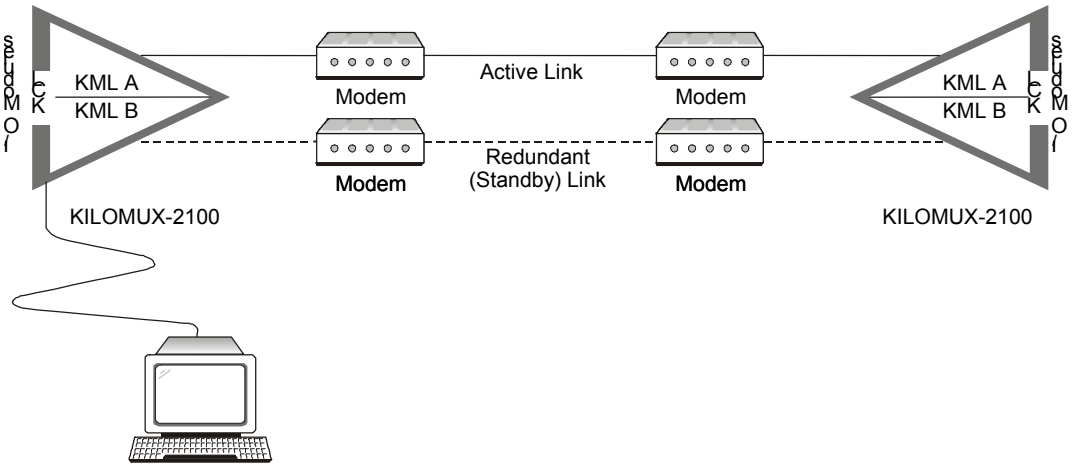


Figure 1-10. Redundant Kilomux-2100 System

Note

- *In this mode, MLA and MLB rates should be the same!*
- *Installing two different KML modules is only available when using a KML 1,2,3 or 4 for both modules.*

Each KML module is connected to an independent internal bus. The internal buses reach each I/O module installed in the enclosure, therefore each module has equal access to each KML module.

When redundancy is enabled, the redundant KML module is automatically programmed exactly like the primary, but its bus is electrically disconnected from the other modules installed in the enclosure. If the primary KML module (or its communication) fails, the other modules are disconnected from the bus of the failed module and connected to the bus of the redundant KML module, which then takes over.

The operator of the Kilomux-2100 unit can select the primary (active) KML module, e.g., in order to switch back to the preferred link after redundancy switching has occurred. This arrangement provides redundancy at both the module and the link level.

Dual Link Operation - Kilomux-2100 Only

Basic Dual-Link Configurations

As an option, Kilomux-2100 allows independent operation of its two multiplexing subsystems. Therefore, by connecting two main links to one Kilomux-2100 equipped with two KML modules it is possible to double the number of payload time slots.
Two dual-link topologies are possible:

- High capacity point-to-point link. A typical system configuration is shown in *Figure 1-11*.
- Two independent links, as shown in *Figure 1-12*. The two links can operate at different data rates.

Modules installed in the enclosure can be freely connected to either of the two links, the only restriction being that all the subchannels of a given module must be assigned to the same link.

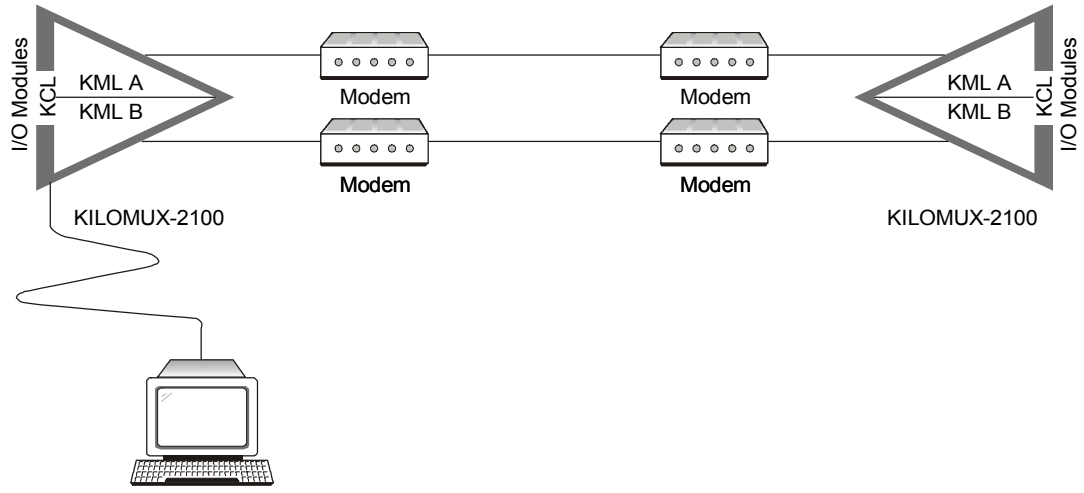


Figure 1-11. Dual Link, High Capacity Point-to-Point Application

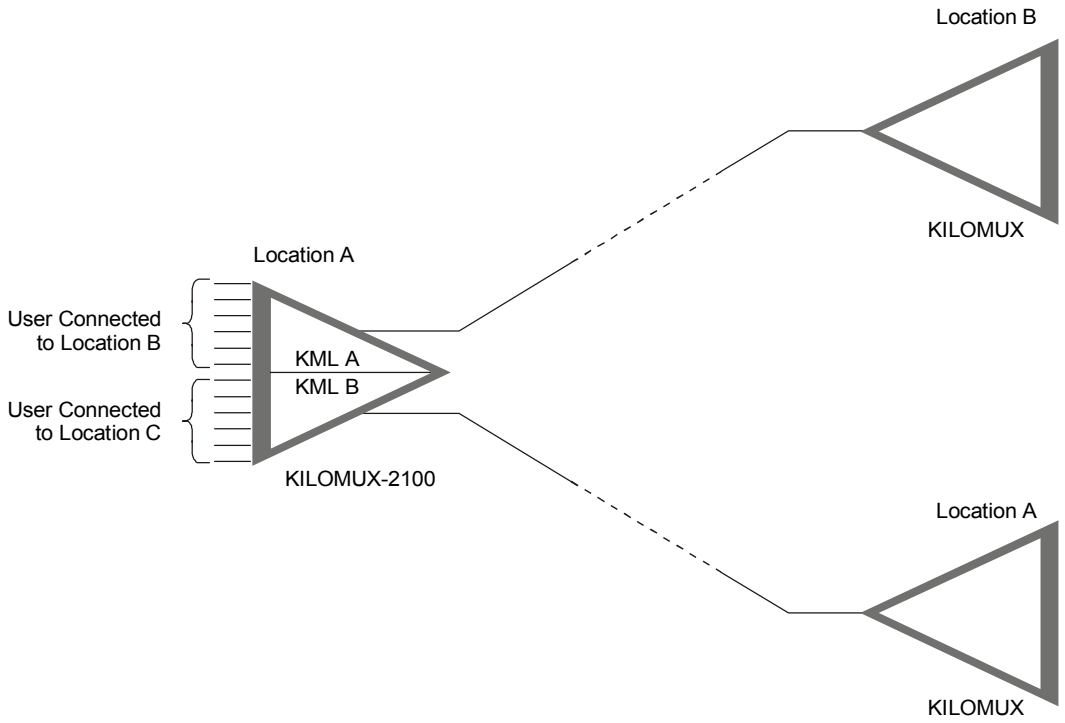


Figure 1-12. Dual Link System, Independent Link Application

Bypassing Configurations

Dual-link configurations also enable direct transfer of channel between the two links (this is called ***bypassing***). This function requires the presence of a KDI module in Kilomux-2100.

Figure 1-13 shows the operation of the basic bypassing configuration. In *Figure 1-13,* some of the users at location A are connected to users at location B, and other users at location A are connected, using the bypassing function of the KDI module, to users at location C (the connection is full duplex). As explained above, with respect to bypassing, the multidrop channel is handled either as a bypassed channel, or as a dropped channel, depending on the state of the RTS line.

The KDI module supports the bypassing of one contiguous block of bits from one link to the other. The bypassed block is specified by three parameters:

- The position of the first bit (the starting bit) of the block to be bypassed in the multiplexed frame of main link A
- The number of bits to be bypassed (the block size)
- The position of the first bit (the starting bit) of the block in the frame of main link B. This may differ from the starting bit on main link A.

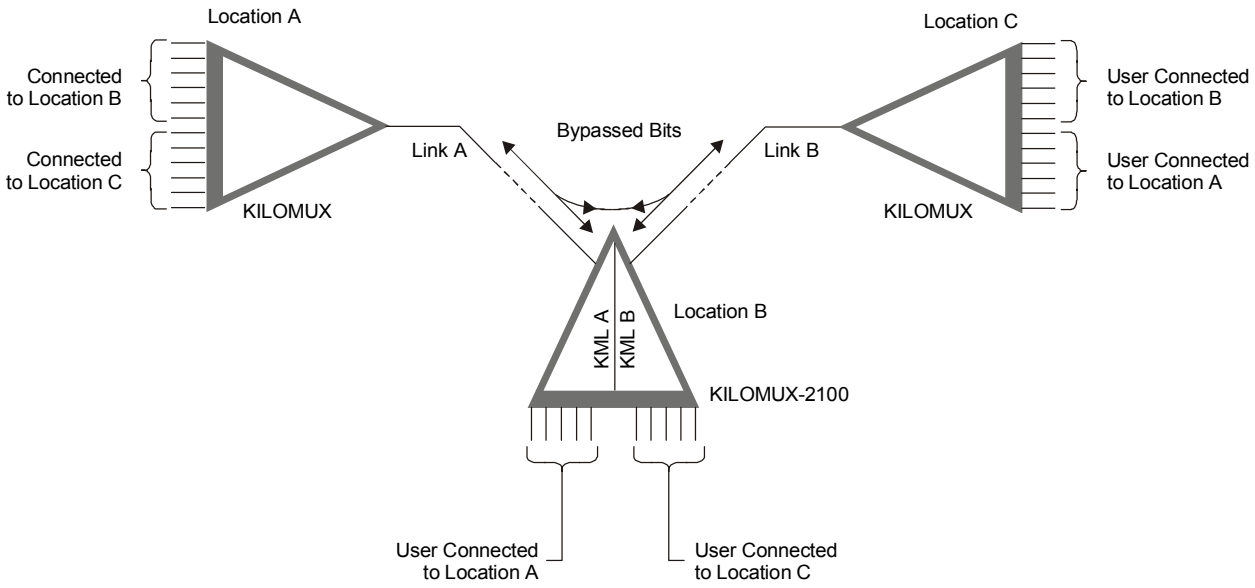


Figure 1-13. Basic Bypassing Configuration

Figure 1-14 shows an example of bit routing between the various units.

Since the bypassing is bit-oriented, the two Kilomux-2100 links can operate at different data rates, but they must use bandwidth allocation units of equal sizes (refer to *Table 1-1* for allowable selections). Therefore, the bypassing can be performed between links operating at rates within the same group of rates:

- 9.6, 14.4, 19.2, 28.8, or 32 kbps (0.4 kbps bandwidth allocation unit)
- 48, 56, 64, 128 or 192 kbps (0.8 kbps bandwidth allocation unit)
- 256 or 384 kbps (1.6 kbps bandwidth allocation unit)
- 512 or 768 kbps (3.2 kbps bandwidth allocation unit).
- 1024 or 1536 kbps (6.4 kbps bandwidth allocation unit).

In order for the user to be able to specify the allocation of main link bits to the individual channels, the structure of the main link frame must be specified by the user. Therefore, in a bypassing application the automatic bit allocation algorithm used by Kilomux-2100 must be disabled, and the allocation must be manually performed. Manual allocation is required for every participating Kilomux-2100.

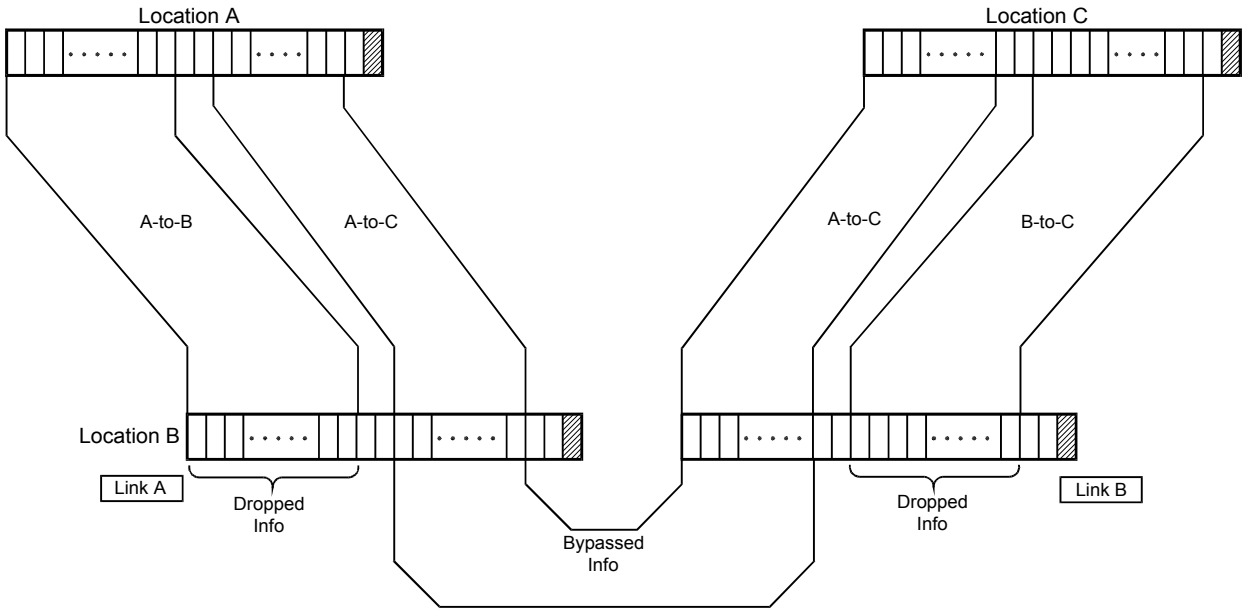


Figure 1-14. Bypassing Parameters

The manual allocation is performed at the level of individual channels, therefore the channels of a given I/O module can be routed to different Kilomux units. This is however possible only if the following conditions are met:

- The I/O modules are not located at a bypassing location, i.e., are not installed in a Kilomux-2100 unit with an active KDI module.
- The I/O modules whose channels are to be routed to different Kilomux units do not use end-to-end transmission of control signals; otherwise, all the channels of an I/O module using end-to-end transmission of control signals must be routed to a single module (this implies that they must be bypassed or dropped together at the same Kilomux-2100).

In the typical bypassing application shown in *Figure 1-15*, two Kilomux-2104 multiplexers, located at two branch offices, are connected to Kilomux-2100 located at the central site. The KDI module installed in Kilomux-2100 located at the central site provides a direct connection between the two Kilomux-2104 units via the central site for selected channels. The connection is performed by transferring (bypassing) the desired group of main link frame bits between the two main link modules. For example, in *Figure 1-15* the bypassed time slots could be used to connect between the two KVF.4 modules identified by No. 2, which are installed in the two Kilomux-2104 units.

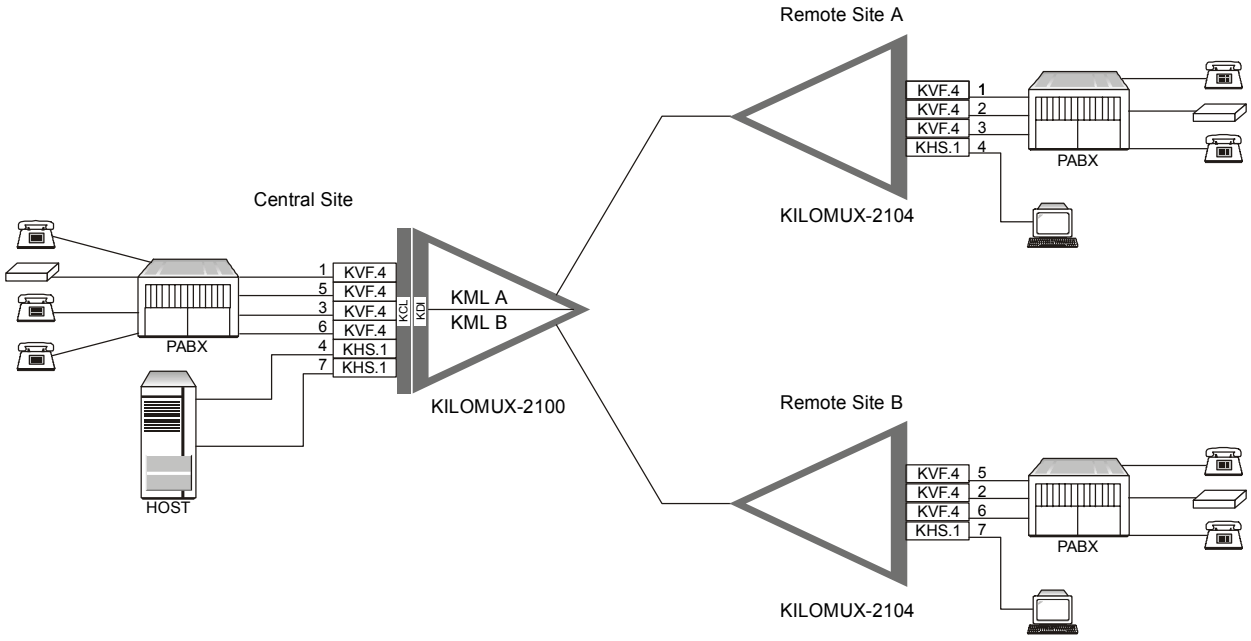


Figure 1-15. Typical Bypassing Application

Channels that are not bypassed are connected to users connected to Kilomux-2100 at the central site: for example, the two channels of the KVF.4 module at location A (identified by No. 3) are connected to the channels of the KVF.4 module also identified by No. 3 which is installed at the central site, and the KHS.1 module at location B (identified by No. 7) is connected to the KHS.1 module at the central site.

Fully digital transmission for bypassing voice channels is an essential requirement to the preservation of high-quality voice reproduction when low bit rate voice compression is used, because it eliminates back-to-back analog interconnections at intermediate locations, and the ensuing analog-to-digital and digital-to-analog conversions. Full digital transmission has significant advantages for data channels as well, because it does away with the cables that would otherwise be required for the connection of data channels, and provides the equivalent of an electronic cross-connect function (programmable by the same means used to control the operation of Kilomux-2100).

Multidrop Configurations

The KDI/M module version includes a data channel interface for multidrop configurations. The multidrop channel is compatible with the data channels of the KLS.1/NEW low-speed data module, and supports data rates in the range of 0.3 to 64 kbps.

As is standard practice in a multidrop application, the receive path of the local multidrop channel continuously receives the traffic carried in the allocated bandwidth on the desired main link, e.g., link A, and in addition the same data is also bypassed to the other link, to make it available downstream. The transmit path of the multidrop channel is connected to main link A only when the RTS line in the local interface is asserted. A typical bypassing and multidrop configuration is shown in *Figure 1-16*.

In the application shown in *Figure 1-16*, the multidrop channel of the KDI module is used to connect between the host computer (connected to a data channel of a KLS.1/NEW module installed in Kilomux-2100 situated at the central site), and several data terminals located at other locations. The communication is based on a polled protocol, whereby the host operates as the master and arbitrates the traffic on the multidrop link by addressing the DTE's one at a time. The multidrop feature operates as follows:

- All the DTE's connected along the link can receive the data sent by the host, because all the multidrop channels of all Kilomux-2100 are allocated bandwidth on link A. In addition, the bandwidth allocated to the multidrop channels is also designated for bypassing to link B, to enable all the downstream DTE's to receive the host.
- When a DTE connected to a KDI/M module has data to transmit toward the host, it must assert its RTS line. The assertion of the RTS line in the multidrop channel interface changes the routing of the main link data by the corresponding KDI/M module:
  - The KDI/M module disconnects the bypassing connection of the multidrop channel data to main link B, and the channel data is dropped locally. As long as the RTS line is asserted, the DTE remains connected to main link A, just as in a point-to-point connection.
  - When the RTS line is deasserted (at the end of DTE transmission), the KDI/M module stops dropping the channel data, and the bypassing path is re-established.

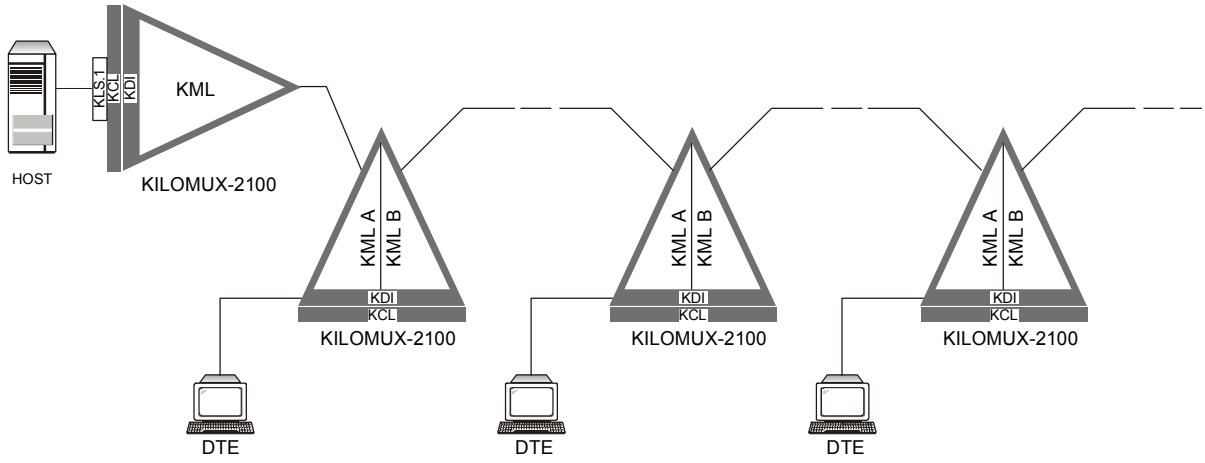


Figure 1-16. Typical KDI Bypassing and Multidrop Application

Priority Bumping - Kilomux-2100 Only

With optional point-to-point dual-link configurations, such as shown in *Figure 1-11,* Kilomux-2100 allows to provide the equivalent of hot-standby protection to critical data channels, without paying for unutilized bandwidth. This feature is called ***priority bumping.***

When priority bumping is selected, the system administrator can define the critical channels as high-priority channels. The high-priority channels can be assigned time slots on either of the two links in accordance with system requirements. Low-priority channels can then be added up to the maximum combined bandwidth of the two links.

When the two main links operate at different data rates, it is possible to select different priorities for switching, from link A to link B, and from link B to link A.

During normal operation, i.e., when both links are operational, all the channels are carried by the assigned links. When one of the links fails, the high-priority channels carried by the failed link are automatically switched over to the operational link. When the management channel is carried by a main link time slot, it is always handled as a high-priority channel.

Switched Backup Operation - Kilomux-2100 Only

Kilomux-2100 provides a switched backup mode of operation that allows the use of dial-up modems operating on low-cost switched data lines (PSTN mode) or ISDN basic access lines as a backup to the main link (ISDN backup mode, based on the use of the KML.10 main link module). Kilomux-2100 allows flexible programming of the switched backup option on a weekly basis. For each day of the week, it is possible to define up to four different time periods, and to specify, for each period, whether the use of the switched backup function is allowed.

The backup capabilities can be determined in two ways:

- By entering the desired configuration in the alternate database stored by Kilomux-2100. This method allows the system administrator to freely select which channels will be transmitted when the backup link is in use, and to specify for these channels different data rates when using the backup link. Note that in this mode the alternate database is dedicated to the backup link, so the "day/night" configuration option cannot be used.
- By defining the channels to be carried when the backup link is used as high-priority channels. In this case, the channel data rates cannot be changed with respect to normal operation, but the backup configuration is contained in the on-line database. Therefore, it is possible to prepare "day/night" configurations using the two Kilomux-2100 databases.

Switched Backup Using Dial-up Modems

A typical PSTN switched backup configuration is shown in *Figure 1-17*. In this configuration, one of the links is configured to carry the normal traffic, and the other link is configured to serve as the backup link.

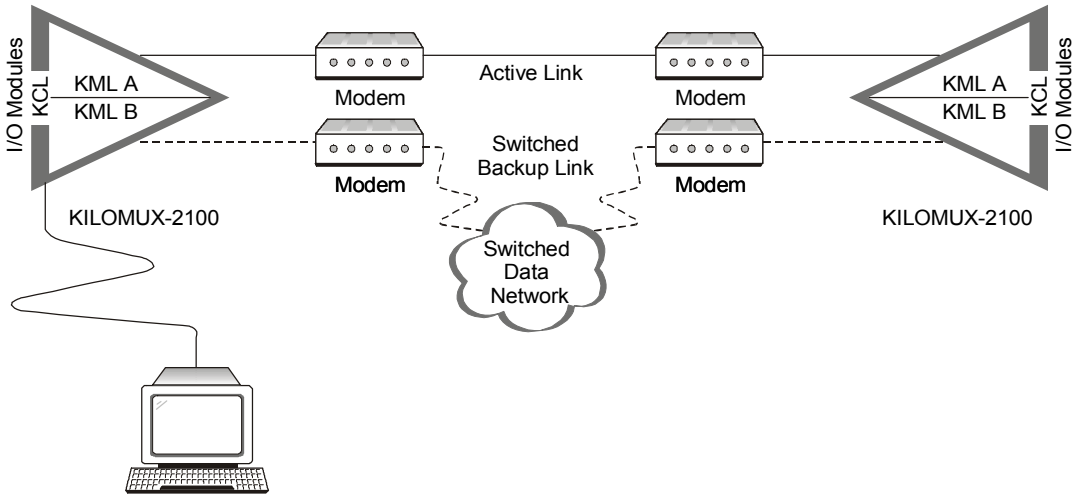


Figure 1-17. Typical Switched Backup Configuration

Since usually the data rate supported by dial-up modems does not exceed 19.2 kbps, the backup link can also be configured for operation at 9.6 or 19.2 kbps. This means that in case of a main link failure, only a fraction of the normal traffic (carried by the channels defined by the system administrator as having high priority) can still be transmitted.

When a failure occurs on the main link, a Kilomux-2100 activates the DTR line in the backup link interface connector. The dial-up modem connected to this link dials a preprogrammed number, to set up a call to the other Kilomux-2100. After the called destination answers, the traffic is switched to the backup link (if the call cannot be established within a predetermined interval, the attempt is aborted).

When the primary link returns to normal operation, the dial-up modem hangs up and thus disconnects the backup link.

Switched Backup Using ISDN Lines

This mode is supported when a KML.10 module is connected to a switched ISDN line. In this case, higher data rates are available for the backup link: 64 kbps (use of one B channel) and 128 kbps (use of both B channels). *Figure 1-18* shows a typical switched backup application.

RAD offers a proprietary algorithm, which enables using both B channels to obtain the 128 kbps rate even when differential delay is present. However, the use of a proprietary algorithm means that KML.10 modules must be installed at both ends of the link. This proprietary algorithm, based on the BONDING mode 1 protocol defined by the Bandwidth-on-Demand Inter-operability Group (BONDING), enables the KML.10 modules to combine the bandwidth of the two B channels while correcting for differential delays of up to 512 ms between the two channels. This delay is sufficient to enable using links which pass through up to two satellite hops.

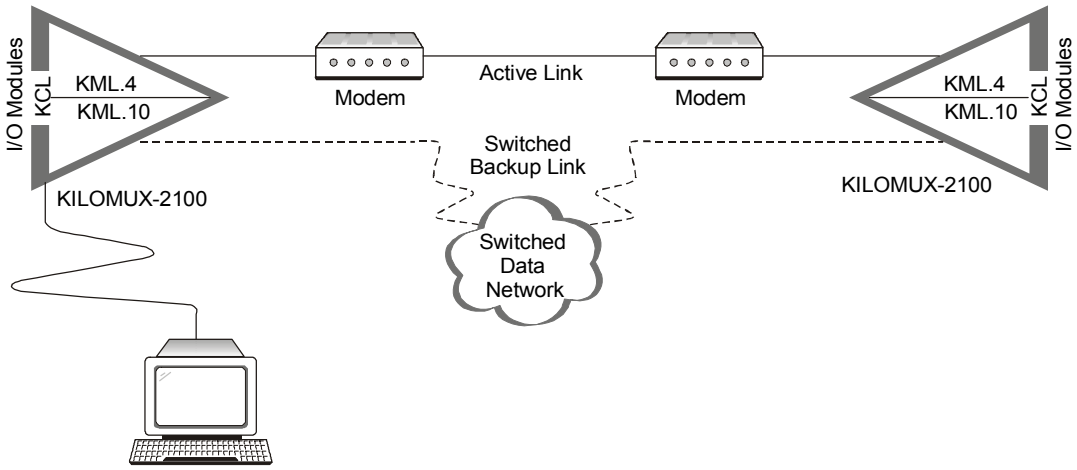


Figure 1-18. Typical ISDN Switched Backup Application

The algorithm works by automatically aligning (i.e., synchronizing and equalizing the transmission delays) the two B channels, a process which uses FIFO buffers that can store data for intervals of the same order as the maximum differential delay to be corrected. The alignment process is performed when communication is first established between the two Kilomux-2100 units, and is repeated each time a loss of main link synchronization occurs, or one of the Kilomux-2100 units is reset (FIFO's are also reset when one of these events occurs). Typically, the channel alignment process requires up to 20 seconds.

The KML.10 module can use various structured leased line services (S0), such as the FV0 Type 4 service available in Germany, and can be configured by the user for optimal support of the following specific ISDN implementations:

- ETSI (Euro-ISDN) NET3
- AT&T 4ESS and 5ESS ISDN switches (custom multipoint, and point-to-point services)
- Northern Telecom DMS-100 ISDN switch
- Bellcore ISDN switch NI1
- NTT (Japanese ISDN version).

Switch Mode

Kilomux provides a dial-up mode of operation that enables users to allocate ISDN basic access lines via the KML.10 module card. The ISDN line is allocated to Main Link A or, for Kilomux-2100 only, Main Link B depending upon the configuration. Kilomux can be configured to operate in one of the following switch modes:

- **Single Switch Mode (Kilomux-2100 and Kilomux-2104)** - The local Kilomux is connected to a remote Kilomux via an ISDN network allocated on a single main link (either Main Link A or Main Link B). Refer to *Figure 1-19*.

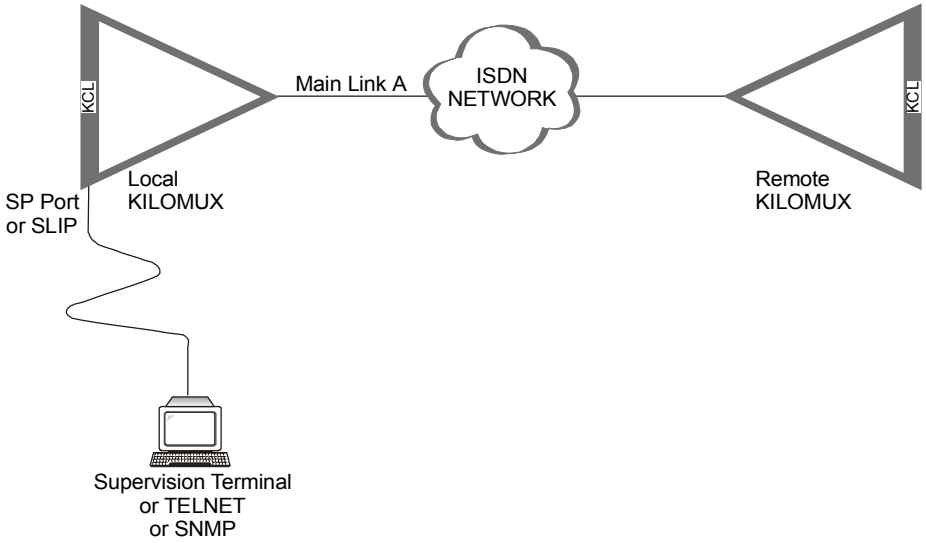


Figure 1-19. Single Switch Mode

- **Dual Switch Mode (Kilomux-2100 only)** - The local Kilomux-2100 is connected to two remote Kilomuxes via an ISDN network allocated to both Main Link A and Main Link B. Refer to *Figure 1-20*.

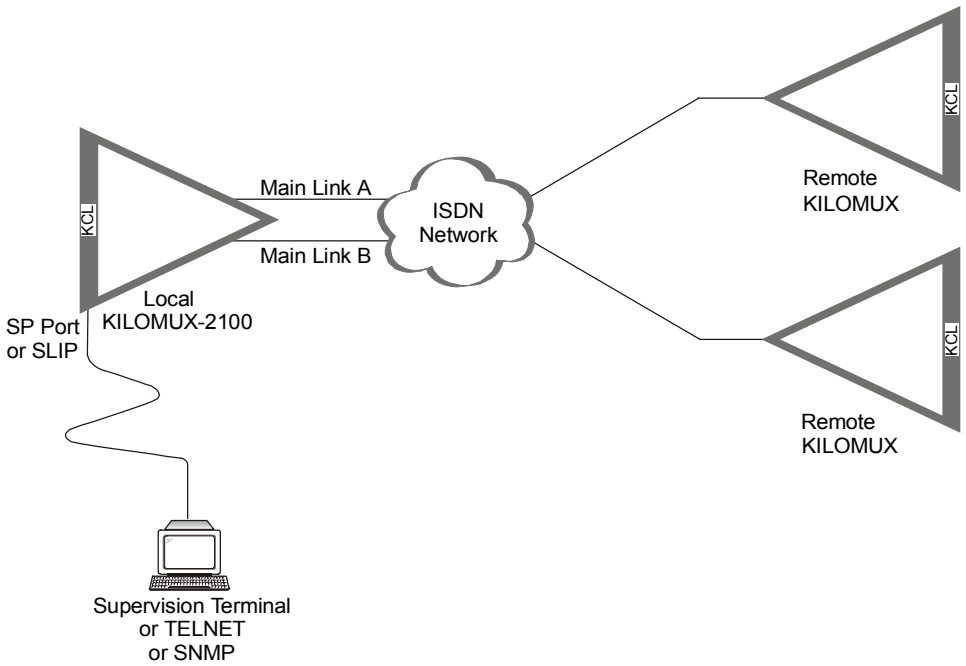


Figure 1-20. Dual Switch Mode

- **Single and Switch Mode (Kilomux-2100 only)** - The local Kilomux-2100 is connected to a remote Kilomux via one of the main links (Main Link A or Main Link B). The local Kilomux-2100 is also connected to a second remote Kilomux via the other main link over an ISDN network. Refer to the following figure.

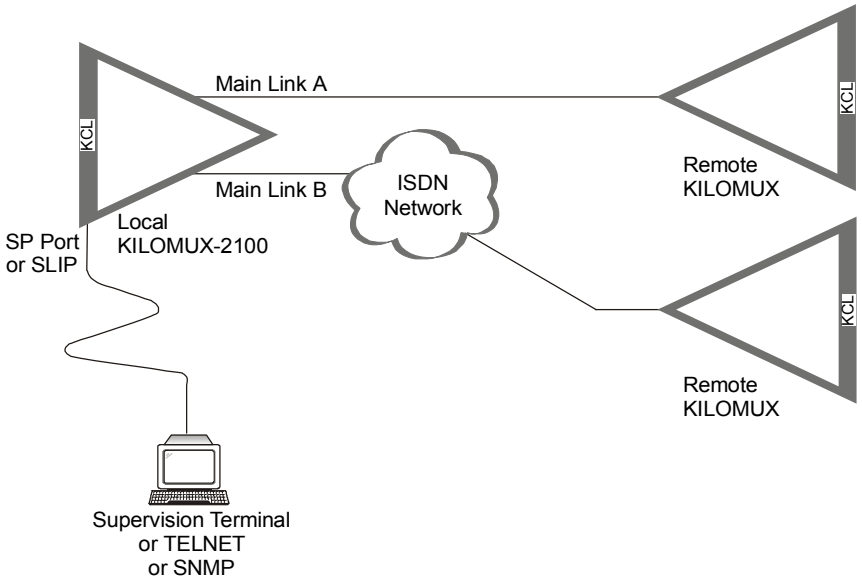


Figure 1-21. Single and Switch Mode

The ISDN line does not need to be connected or available to all applications at all times. The different switch modes can allocate the ISDN line as follows:

- **Connect after power up** - Configures Kilomux to connect the ISDN line from power up until power off. Using this option, the ISDN line is always open during a Kilomux session.
- **Manual** - Configures Kilomux to trigger the ISDN line connection only upon operator request by using the `Connect Switch` command. The ISDN line remains open until the operator requests to disconnect by using the `Disconnect Switch` command. For information on the `Connect Switch` and `Disconnect Switch` commands, refer to the *Command Set Description* appendix.
- **Automatic** - Configures Kilomux to automatically connect the ISDN line when an I/O request is made. The data cards KLS.1/N, KLS.2, KHS.1 and KHS.2 and the KVF.4 voice card (analog interfaces only) provide a trigger to automatically connect the ISDN line. These data and voice cards must be assigned a high priority (via the `DEF CON` command) to allow the trigger to begin dialing. After the I/O transfer is completed, the ISDN line is automatically disconnected. Kilomux sets the priority levels for the data and voice cards.

System Management

Equipment Management Methods

Kilomux supports the following management methods:

- Local Management
- Remote Management
- Neighbor Management.

The KCL.2 module of the Kilomux system is available with a Supervisory Port Connector (CONTROL port) and with one of the following three Management Port interfaces:

- MNG: 9-pin Dial Port
- ETHERNET: UTP Ethernet interface
- ETHERNET: BNC Ethernet interface.

The Supervisory Port Connector and the Management Port are located on the rear panel of the KCL.2. These interfaces allow the operator to manage the local or remote Kilomux in several modes.

Local Management

Kilomuxes are connected via a link. One Kilomux is local and the other is remote. Local management operates and configures the local Kilomux. There are several options for local management:

- Supervisory Port Connector - Allows the operator to manage a local Kilomux from a standard ASCII terminal, or via a SLIP connection through TELNET or a RADview networking management station.
- MNG Port **-** Dial-out port for alarm reporting.
- ETHERNET Port **-** Manage a local Kilomux over a LAN. TELNET or a RADview networking management station connected to the LAN can configure or operate Kilomux. Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.

Remote Management

Kilomuxes are connected via a link. One Kilomux is local and the other is remote. Remote management operates and configures the remote Kilomux. The management of a remote Kilomux can be performed either in-band (refer to *Figure 1-22*) or out-of-band (refer to *Figure 1-24*). In these options, the remote Kilomux requires an IP address. For information on assigning an IP address, refer to the *DEF AGENT* command in the *Command Set Description* appendix.

In-Band

A remote Kilomux can be managed via the local Kilomux and the data frame. Some of the bandwidth of the main link between the two Kilomuxes is used to relay the management information. An operator can also download software using the main link.

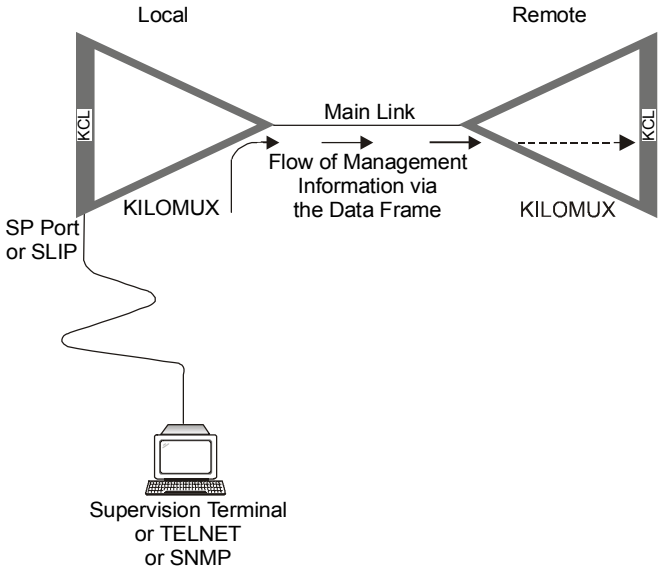


Figure 1-22. Remote Management: In-Band

Note *Management information can be passed from a local Kilomux to a remote Kilomux via the data frame. On the local Kilomux, connect a supervision terminal, TELNET, or SNMP to the KLS1, KLS2 card. On the remote Kilomux, use a cross-cable to link the KLS1, KLS2 card with the SP port on the KCL.2. For a description of this method, refer to Figure 1-23.*

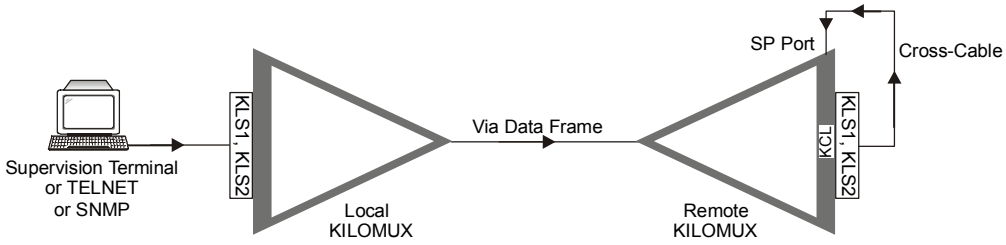


Figure 1-23. Using the Data Frame

Out-of-Band

A remote Kilomux can be managed out-of-band via:

- A modem
- An Ethernet connection, refer to *Figure 1-24*
- Dedicated time slot in KML.7 or KML.8. - An unused time slot in the KML.7 T1 network or KML.8 E1 network is assigned to pass the management information.
- Time slot 0 in KML.8 (E1 network) or f-bit in KML.7 (T1 network) is assigned to pass management information. Management information is not included in the data frame.

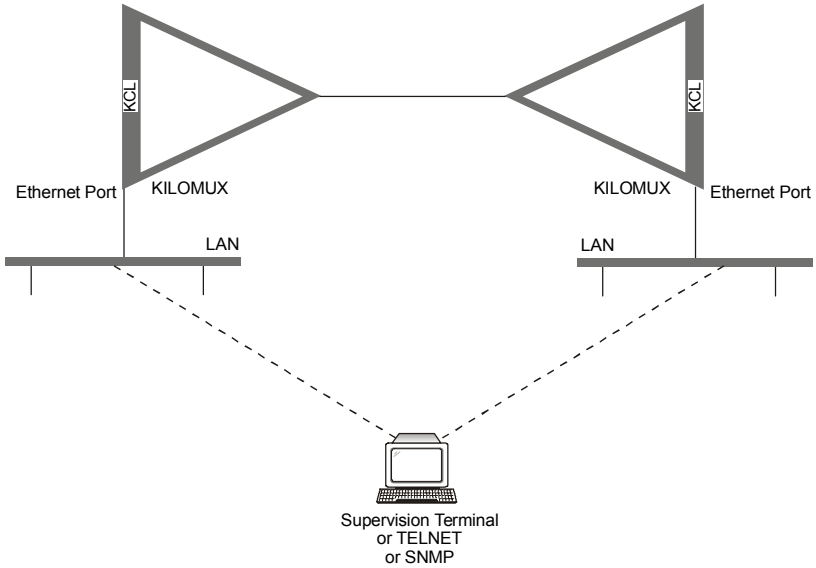


Figure 1-24. Remote Management: Out-of-Band

Neighbor Management

You can configure a Kilomux without a direct connection to a RADview Network Management Station (or TELNET or SNMP) and without using out-of-band management. Neighbor management allows management information to be sent via a SLIP connection to linked Kilomuxes. Kilomuxes are connected from the Network Port (NP)-DTE on one Kilomux to the Supervisory Port (SP)-DCE on another Kilomux. TELNET, SNMP or a RADview management network station is connected via SLIP to the SP-DCE port on the first Kilomux in the link.

Each Kilomux has an IP address. Management information is sent via the SLIP connection to a particular Kilomux in the link using the IP address of the Kilomux.

DXC, FCD or MEGAPLEX equipment can also be linked to the Kilomuxes.

The following examples illustrate possible configurations using neighbor management:

- **Local neighbor management** - Management information is sent to each Kilomux via the NP-DTE to SP-DCE connections using the IP address of the Kilomux. Refer to *Figure 1-25*.

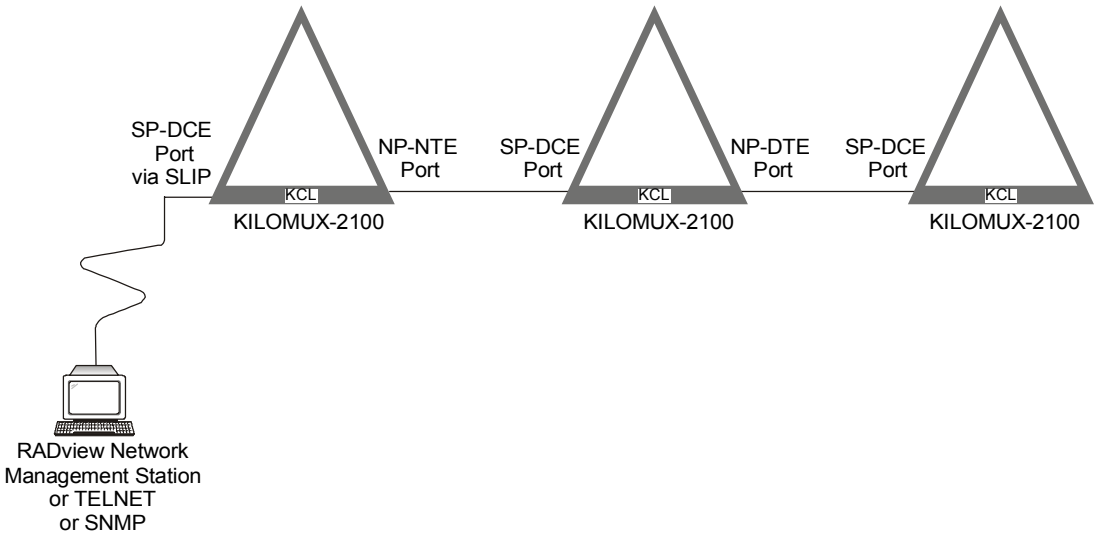


Figure 1-25. Local Neighbor Management

You can also manage multiple Kilomuxes by connecting Kilomuxes to an Ethernet hub. This configuration can prevent communication problems due to equipment failure.

- **Remote neighbor management** - A local Kilomux connects to a remote Kilomux via the main link. The remote Kilomux connects Kilomuxes on the remote side using the NP-DTE to SP-DCE connections. Management information is sent via the main link of the local Kilomux to any of the linked remote Kilomuxes using the IP address of the Kilomux. Refer to *Figure 1-26*.

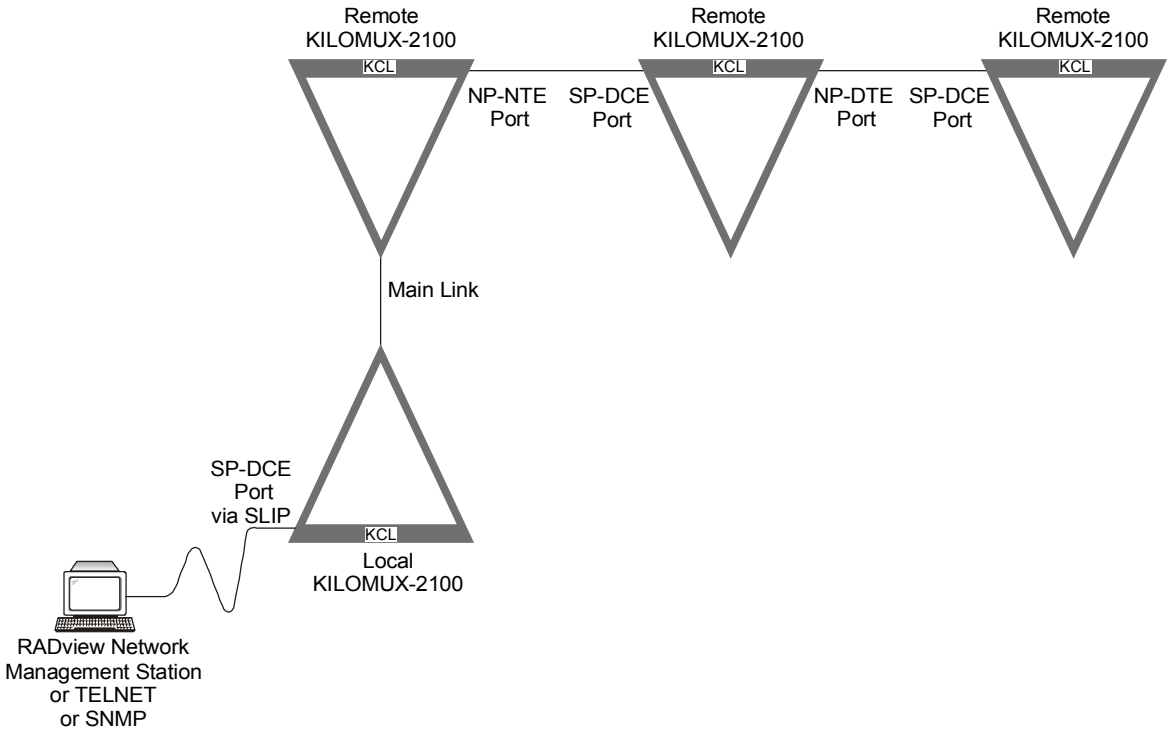


Figure 1-26. Remote Neighbor Management

- **Neighbor management with other RAD devices** - Management information can be sent via a Kilomux to a DXC, FCD or MEGAPLEX. Link the Kilomux with a RAD device by connecting the NP-DTE port of the Kilomux to the SP-DCE port of another RAD device. Refer to *Figure 1-27*.

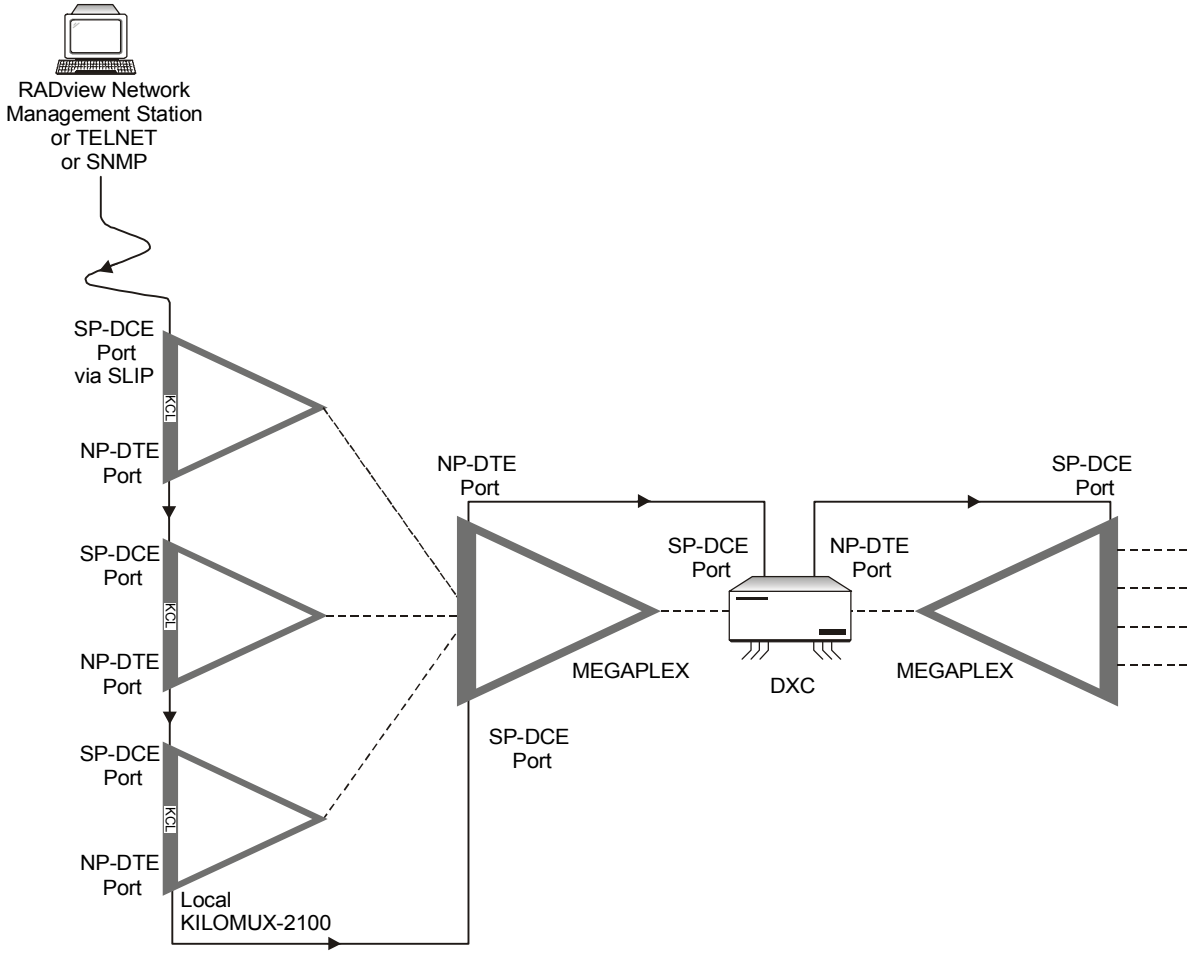


Figure 1-27. Neighbor Management with other RAD Devices

- There is no indication for the remote loss of frame synchronization, or for the loops connected at the remote end of the link.
- Remote channel loops are activated on the local channel, therefore such loops return data toward the remote Kilomux-2100.
- It is not possible to simultaneously activate local and remote loops.
- To perform channel tests by tone injection (voice channels) or pseudo-random sequence transmission test (data channels), it is necessary to activate a local main link loop, or to make an appropriate loopback connection at the remote end of the link.

Management Communication Port

Kilomux is available with a Supervisory Port Connector (Control port) and with one of the following three Management Port interfaces on the KCL.2 module:

- **MNG**: 9-pin Dial Port
- **ETHERNET**: UTP Ethernet interface
- **ETHERNET**: BNC Ethernet interface.

Supervisory Port Connector

The 9-pin D-type female type connector located on the KCL.2 module (the Supervisory Port connector) can be used to manage the Kilomux unit by means of an ASCII terminal, a RADview network management station, or TELNET over SLIP. The communication parameters of this port can be selected in accordance with system requirements:

- **Data rate** - 9.6 - for use with ASCII terminal or SLIP connection
  - 19.2, 38.4 or 57.6 kbps - for use with SLIP connection only.
- **Word format** - One start bit
  - Seven or eight data bits
  - Even, odd or no parity
  - One stop bit.
- **Interface type** - DCE or DTE (user selectable).

Ethernet Port

The KCL.2 module can be ordered with either a UTP or a BNC Ethernet connector.

Dial Port Connector

The KCL module can be ordered with an additional, 9-pin D-type female type connector as the MNG port.

This port is intended for connection to a Hayes™ or Hayes-compatible dial-up modem. The reporting method can be programmed by the user, in accordance with the following options:

- Always send a report whenever a new alarm or event condition is detected
- Reporting disabled (no dial-out function).

When it is necessary to report an alarm condition, Kilomux initiates the call set up. After the destination answers, Kilomux sends the complete contents of the alarm buffer. Following the transmission of the alarm buffer contents, Kilomux disconnects automatically.

To increase reporting reliability, Kilomux enables the user to define the number of dialing retries, and an alternate number, to be called in case the primary number cannot be reached. If the call cannot be established, the full contents of the buffer are sent the next time a call is set up.

System Timing Considerations

One of the critical requirements of data communications networks is timing accuracy. The basic requirement is that all the equipment in the network must operate at exactly the same clock rate or at an integer sub-multiple of the clock rate. If this condition is not met, then from time to time bits transmitted between two equipment units that operate at even slightly different clock rates will be lost, or the same bit may be read twice. Such occurrences, which lead to the loss of bit count integrity, are highly undesirable and may cause severe and periodic disruptions in network operation.

Many networks use very accurate timing sources, such as atomic clocks, to provide the primary timing signals to the main network nodes, e.g., telephone switching offices, digital switches, etc. From the nodes, the timing is disseminated via the communication links.

Since very accurate timing sources are often free-running, communication equipment usually includes "elastic" buffers that absorb small timing differences. An elastic buffer is a first-in first-out (FIFO) memory with separate write (input) and read (output) clocks. For example, such buffers are inserted in the receive path of the Kilomux KML modules operating in the DTE or external DCE modes.

Kilomux is designed to support reliable propagation of the timing information, by allowing the selection of the appropriate timing mode in accordance with system requirements and the type of main link interface module installed in the unit. The following are the different main link interfaces with the available types of timing modes:

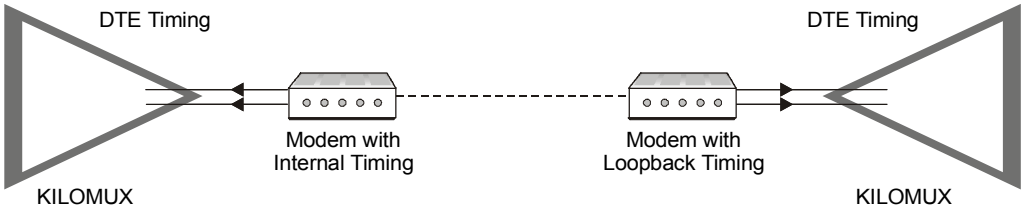
- With KML.1, KML.2, KML.3 and KML.4 modules, three main link timing modes are available: DTE, External DCE and DCE.
- When operating in the DCE or external DCE modes, the timing of the main link transmit clock can be locked to an external source (the external clock signal supplied to one of the data channels), or derived from an internal oscillator.
- With KML.5 and KML.6 modules, two main link timing modes are available: Internal and Loopback.
- With KML.7, KML.8 and KML.F modules, three main link timing modes are available: Internal, Loopback and DCE.
- The KML.10 module recovers the clock from the receive line signal; the recovered clock is used for synchronizing Kilomux. Kilomux must operate in the DTE timing mode.
- With KML.11 module, three main link timing modes are available: Internal, adaptive and external.

To ensure that a reliable timing source is used even when the source selected to provide the preferred timing reference fails, Kilomux allows the selection of an additional fallback source. The fallback source is automatically connected when the main source fails. If both the main and fallback sources fail, Kilomux will switch to the internal oscillator.

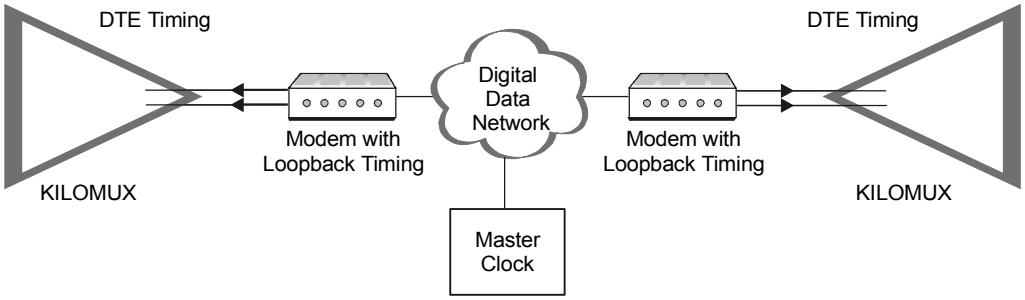
The main characteristics of each main link-timing mode are explained in the following sections.

DTE Timing (KML.1, KML.2, KML.3, KML.4 and KML.10 Modules)

With DTE timing, both the main link receive and transmit paths of the Kilomux unit receive external clock signals. *Figure 1-28* shows two basic network configurations that use the DTE timing mode.



A. Leased Line Configuration



B. Digital Configuration

Figure 1-28. Network Configurations Using DTE Timing

In the leased line configuration (A) of *Figure 1-28*, two Kilomux units communicate through a leased line using two high-speed modems, or other transmission equipment (e.g., higher-speed digital multiplexers) capable of supporting the required main link data rate. The modems provide the transmit and receive clock signals to the Kilomux units. In this configuration, the modem connected to one of the Kilomux units is selected to provide the timing reference for the whole link, by selecting its INTERNAL timing mode. The other modem is set to operate in the LOOPBACK timing mode, thereby ensuring that both Kilomux units derive their timing reference from the same source.

In the digital configuration (B) of *Figure 1-28*, two Kilomux units communicate through a digital transmission network, e.g., a national or private carrier network, or an ISDN network (in the latter case, the connection is usually made by means of KML.10 main link modules).

Digital data and ISDN networks usually incorporate very accurate timing sources, which are always preferable. In many cases these networks will not accept data at a rate that differs from their own rate. In the digital configuration, the modems that connect the Kilomux units to the digital data network are set to operate in the LOOPBACK timing mode. This ensures that the two Kilomux units derive their timing reference from the accurate master clock provided by the network.

When operating in the DTE timing mode, buffers are used in the receive and transmit data paths to allow retiming and to absorb short-term timing instabilities. Buffers size is ±8 bits; when operating over satellite links, the receive buffer size can be increased to ±256 bits.

External DCE Timing (KML.1, KML.2, KML.3, KML.4 and KML.11 Modules)

With external DCE timing, Kilomux provides the main link transmit clock signal to the modem, and accepts a receive clock signal from the modem. In this timing mode, it is necessary to specify the transmit timing reference source. Two reference sources can be used:

- **External**. The Kilomux main link transmit timing is synchronized to the transmit clock of a data module channel. The desired channel is selected by the operator, and must operate in the DTE2 clock mode.

  The external mode is very useful when one or more of the Kilomux channels are connected to a AT&T DDS link, or to a similar data network. A typical configuration with the Kilomux units connected as a tail-end link for channels using the DDS network is shown in *Figure 1-29*.

  The DDS network can provide highly accurate timing and will accept only data with similar accuracy, therefore it is necessary to lock the timing of the Kilomux link to the channel timing. This is accomplished by operating the modem connected to the left Kilomux in the EXTERNAL timing mode. The other modem is set to operate in the LOOPBACK timing mode, thereby ensuring that the right Kilomux unit derives its timing reference from the same source.

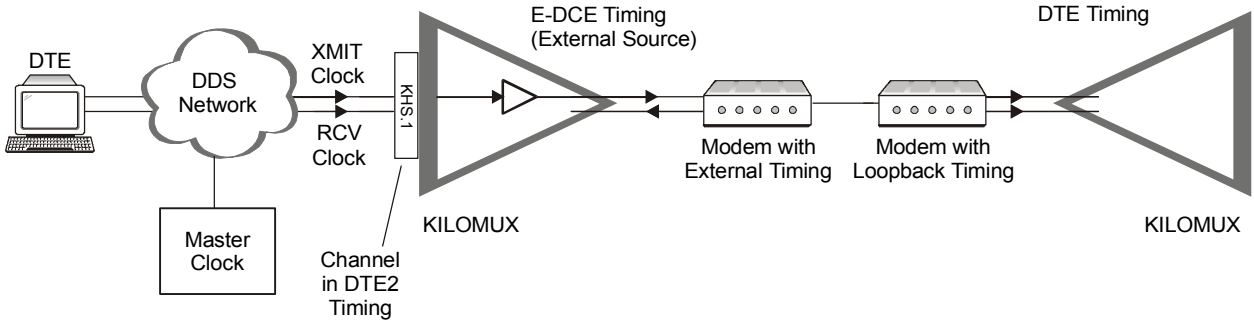


Figure 1-29. Typical External DCE Timing Application

- **Internal timing**. The source for the internal timing signals is a crystal oscillator located in the KML module. The timing accuracy of this oscillator is ±50 parts per million (ppm).

  The internal timing mode can be used in point-to-point links and in independent networks. In any system, only one unit may operate with internal timing. All the other units must use DTE timing to ensure synchronization. In this way, the unit that operates with internal timing is the source of the master clock and determines timing of the entire network.

In the external DCE mode, buffers are used in the main link receive path, but not in the transmit path. Buffer size is selectable, ±8 or ±256 bits.

DCE Timing (KML.1, KML.2, KML.3 and KML.4 Modules)

With DCE timing, Kilomux provides both the transmit and receive clock signals to the equipment to which it is connected, e.g., a Megaplex-2100. The timing reference source of the transmit timing signals can be selected as for the external DCE mode. The connected equipment must then use the DTE timing mode.

The DCE timing mode is useful when the Kilomux main link is connected to a channel of a corporate data transmission system (e.g., the main link of one of the Kilomux units is connected to a data channel of a Megaplex-2100), and one or more of the Kilomux channels are connected to a data network which provides accurate timing (e.g., to a DDS link, an ISDN line, or another data network). In this case, the network timing can be distributed through Kilomux to the other parts of the system. *Figure 1-30* shows a typical connection to a DDS network through a KHS.1 module; for connection to an ISDN line, replace the KHS.1 module with a KHS.U module.

In the DCE mode, no buffers are used in the main link data paths, because Kilomux determines the receive and transmit rates.

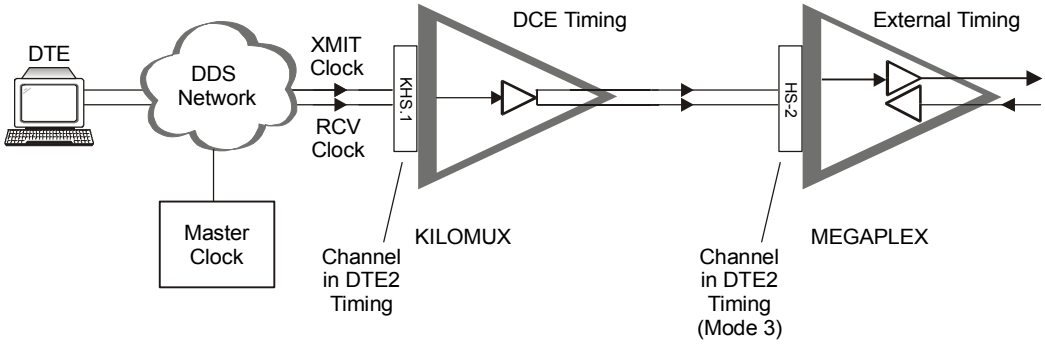


Figure 1-30. Typical DCE (KML.1–4) Timing Application

Internal Timing (KML.5, KML.6, KML.7, KML.8, KML.11 and KML.F Modules)

When the internal timing mode is used with a KML.5, KML.6, KML.7, KML.8, KML.11 or KML.F module, the source for the internal timing signals is a crystal oscillator located in the main link module.

The internal timing mode can be used in point-to-point links and in independent networks. In any link or network, only one Kilomux unit may operate with internal timing. All the other units must use loopback timing (adaptive when working with KML.11) to ensure synchronization. In this way, the unit that operates with internal timing is the source of the master clock and determines timing of the entire network.

Figure 1-31 and *Figure 1-32* show a basic network configuration that uses a KML.5 or KML.6 module in the internal timing mode in conjunction with loopback (adaptive for the KML.11) timing.

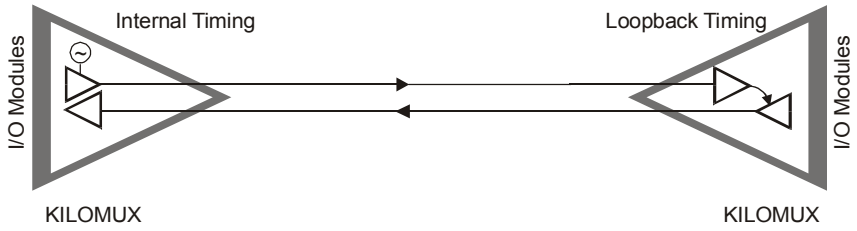


Figure 1-31. Typical Internal Timing Mode Application (KML.5, KML.6, KML.7, KML.8, and KML.F Modules)

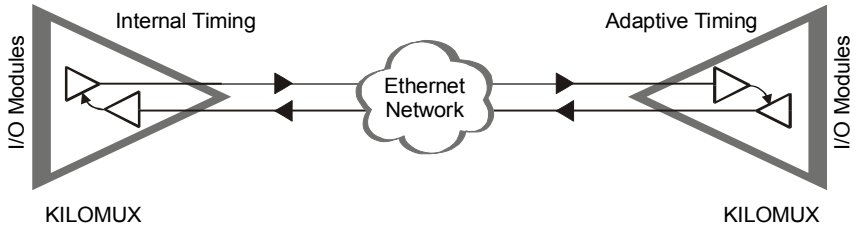


Figure 1-32. Typical Internal Timing Mode Application (KML.11 Module)

Loopback Timing (KML.5, KML.6, KML.7, KML.8, and KML.F Modules)

With loopback timing, the main link transmit clock is locked to the receive clock, recovered from the receive data signal. In effect, with loopback timing Kilomux is sending back data at the same rate data is being received.

The loopback mode can be used as shown in *Figure 1-31*, however there is an additional important application for the loopback mode, as shown in *Figure 1-33*.

In the configuration of *Figure 1-33*, two Kilomux units communicate through a G.703 link provided by a digital transmission network, e.g., the national network or a private carrier network, or by the DDS network. Such networks usually incorporate very accurate timing source, which are always preferable. Loopback timing then allows the locking of the transmit timing of both Kilomux units to the accurate master clock provided by the network.

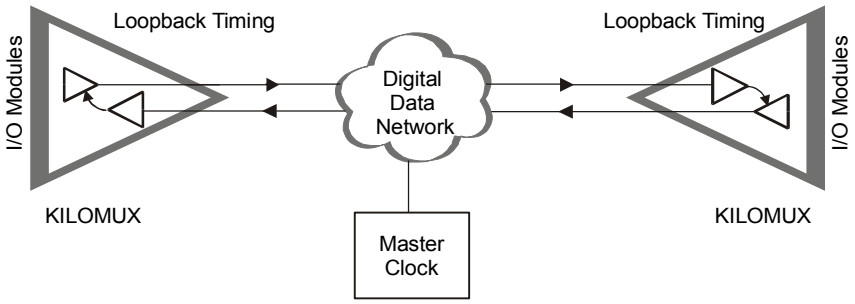


Figure 1-33. Typical Loopback Timing Application

DCE Timing (KML.7, KML.8, KML.11 and KML.F Modules)

When the DCE timing mode is used with a KML.7, KML.8, KML.11 or KML.F module, the timing signals of both the Kilomux unit's main link receive and transmit paths is taken from one of the I/O module channels. Alternatively, in dual link chassis configurations, the timing can be taken from the other main link module.

DCE Timing from I/O Channel

Similarly to the Internal mode, the DCE timing mode can be used in point-to-point links and in independent networks. In any link or network, only one Kilomux unit may operate with DCE timing. All the other units must use loopback timing (adaptive when working with KML.11) to ensure synchronization. In this way, the unit that operates with DCE timing is the source of the master clock and determines timing of the entire network.

Figure 1-34 and *Figure 1-35* show a basic network configuration that uses a KML.7, KML.8, KML.11 or KML.F module in the DCE timing mode at the local Kilomux, with the timing taken from one of its KHS.1 channels. In conjunction, the remote Kilomux operates in the loopback timing (adaptive timing for the KML.11) mode.

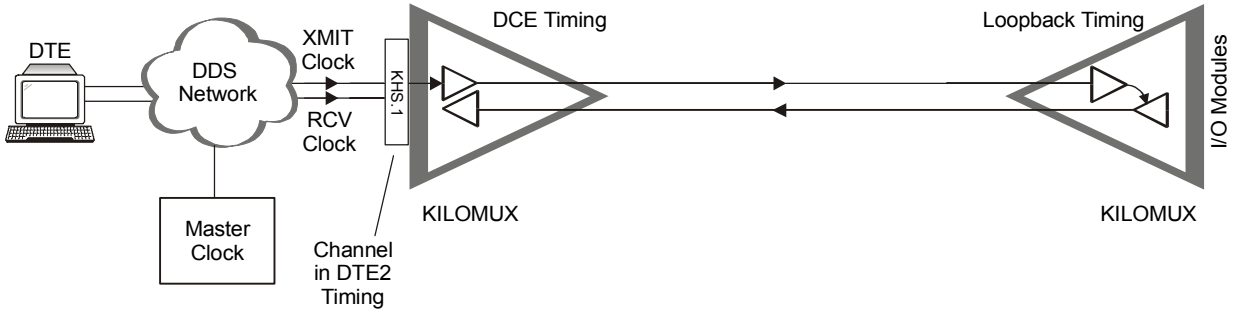


Figure 1-34. Typical DCE from I/O Timing Mode Application (KML.7, KML.8, KML.F)

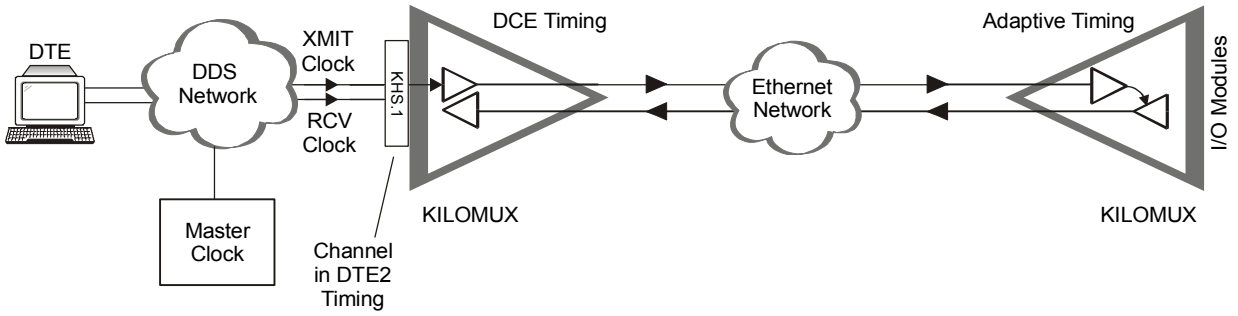


Figure 1-35. Typical DCE from I/O Timing Mode Application (KML.11)

DCE Timing from Main Link

In dual link configurations, the DCE timing mode can be used by the KML.7, KML.8 or KML.F main link module in order to use the other installed main link as the timing source. The source main link can be of any type (for example KML.1), and be operating in any of the timing modes relevant for the type, as were previously described.

Figure 1-36 shows a basic dual link configuration that uses a KML.7, KML.8 or KML.F module (KML A) in the DCE timing mode, with the timing taken from the other main link (KML B). In conjunction, the remote Kilomux connected to KML A operates in the loopback timing mode to ensure synchronization. The clock for KML B can be any relevant internal or external source.

Note *When a main link operates in DTE timing mode with the other main link as the clock source, the receiving main link timing must be locked to the source main link clock by the DEF SYS command (defined by the LINK_CLK parameter).*

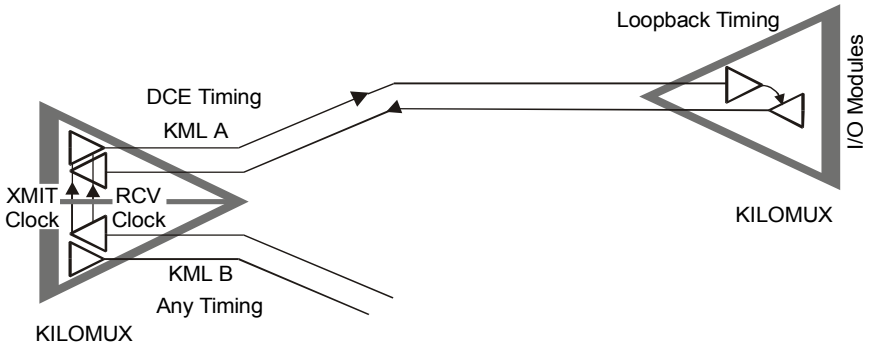


Figure 1-36. Typical DCE from ML Timing Mode Application (KML.7, KML.8, KML.F)

Adaptive Timing (KML.11 Module)

When the adaptive timing mode is used with the KML.11 module, the source for the adaptive timing signals is VCXO, which is controlled by the D/A device. When the jitter buffer exceeds “high jitter length”, the D/A’s speed increases the main link rate. When the jitter buffer reaches “low value”, the D/A’s speed decreases the main link rate.

The adaptive timing mode can be used in point-to-point links and in independent networks. In any link or network, only one Kilomux unit may operate with internal timing and the other with adaptive timing. Figure 1-37 shows a typical connection through a IP network using a KML.11 module

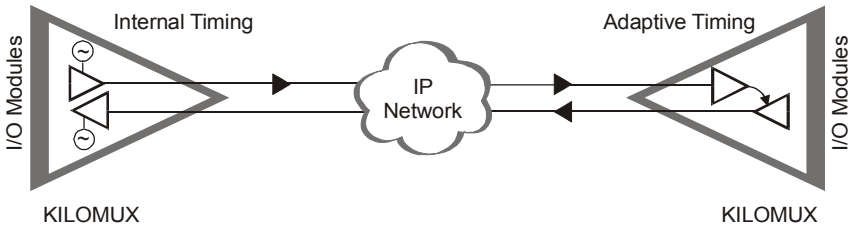


Figure 1-37. Typical Adaptive Timing Application

Main Link Timing Considerations in Bypassing and Multidrop Configurations

In bypassing and multidrop configurations, data is directly transferred between the two links of a Kilomux-2100 unit. To maintain bit integrity, the two links must have a common timing reference. All the Kilomux units connected in a system that uses bypassing and multidropping must use a common timing reference.

The KDI module can be used to determine the reference source for both main links of a Kilomux-2100, by internally locking their timing. The available selections are as follows:

- **Link A**: the clock of main link A serves as the local reference, therefore the timing of link B is locked internally to link A timing.
- **Link B**: the clock of main link B serves as the local reference, therefore the timing of link A is locked internally to link B timing.
- **None**: each link interface receives external timing signals from a common reference source.

When two links in a system configuration are connected to different channels of a data network, neither link can be selected as a timing reference for the other link. The channels have their own timing reference. The connections are usually made by modems or other data communication equipment that provides receive and transmit timing signals, and the two links use DTE timing. In this common situation, the common timing reference requirement is inherently fulfilled (the timing reference is provided by the data transmission network).

Data Channel Clock Modes

Kilomux provides several clock modes for data channels. The following various system I/O modules support all, or some of these modes.

- **Clock Mode 1 - DCE.** In the DCE clock mode, the Kilomux channel provides transmit and receive clocks for the equipment connected to the data sub channel, as shown in *Figure 1-38*. This clock mode is usually required for connection to DTE equipment.

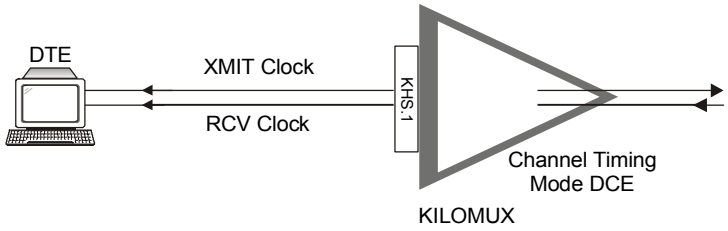


Figure 1-38. Clock Mode 1 (DCE)

- **Clock Mode 2 - DTE1.** In the DTE1 clock mode, the Kilomux data channel sends data accompanied by clock to the connected equipment and accepts data from the equipment according to the equipment clock, as shown in *Figure 1-39*. In this mode, an elastic buffer (FIFO) is used in the receive path of the channel to absorb timing jitter. For KLS.1 data modules, the elastic buffer size is ±2 bits; for KHS.1 data modules, the buffer size is ±4 bits.

  This clock mode is usually required for "tail end" connections, when a DCE is connected to a data sub channel, and its timing is locked to the Kilomux timing.

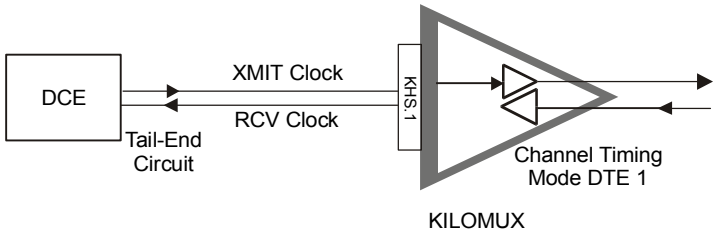


Figure 1-39. Clock Mode 2 (DTE1)

- **Clock Mode 3 - DTE2.** In the DTE2 clock mode, the Kilomux data channel transmits and receives data according to the clock received from the modems that connect it to the transmission equipment.

To compensate for jitter and short-term instabilities, elastic buffers are used at the input and output of each channel (±2 bits for KLS.1 data modules, and ±4 bits for KHS.1 modules).

The DTE2 clock mode is required in various applications, such as data channels connected to a digital data switch. The data switch provides the clock signal for both Kilomux and the equipment connected to Kilomux (*Figure 1-40*). The clock signals are received from the modems serving the data channel.

When operating channels in the DTE2 clock mode, one of the data channels can be selected as the external timing reference source for the entire system timing. The external timing option is always used because it ensures the main link transmit and receive data rates are locked to the corresponding channel rates. If the main link data rates are not locked to the corresponding channel rates, bit integrity will be lost. Kilomux units integrated in a large network that includes a master timing reference ensures locked timing without the use of external timing. The master timing source is used by all the equipment in the network. This includes data equipment connected to the Kilomux channels and the transmission equipment serving the main link. Do not use the DTE2 clock mode when the main link timing is derived from the internal oscillator of Kilomux.

If you are using a Kilomux equipped with KML.5, KML.6, KML.7, KML.8, KML.10, or KML.F modules and you cannot attain the conditions for master timing as described above, do not use DTE2 clock mode.

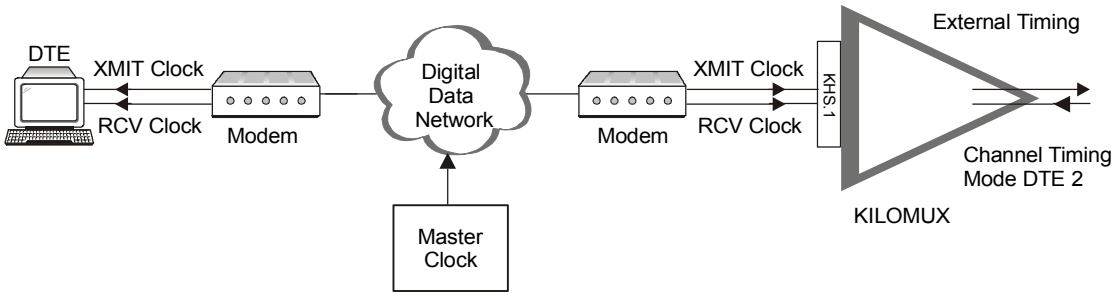


Figure 1-40. Clock Mode 3 (DTE2)

Timing Modes of ISDN Channels

ISDN basic rate access channels are available on the KHS.U and KVF.4/S0 modules. These channels provide the interface between the Kilomux system and the ISDN network.

Timing of Channels with "U" Interface

The transmit timing of a channel with "U" interface, such as a KHS.U module, is locked to the nodal timing of Kilomux. The system nodal timing depends on the selected operating mode of the channel:

- **NT Mode.** In the NT mode, the ISDN "U" interfaces are usually connected to an ISDN switch, whose timing is generally provided by an accurate and stable source.

  One of the "U" interface ports connected to the network termination (NT) unit must be selected as an external clock source for Kilomux. Thus the Kilomux nodal clock, and therefore the transmit timing of the "U" interface, are locked to the timing of the NT unit.
- **LT Mode.** Kilomux provides the transmit clock for the "U" interface. The receive timing is recovered from the signal received from the user's terminal equipment.

Timing of Channels with "S" Interface

The transmit timing of a channel with "S" interface, such as a KVF.4/S0 module, depends on the selected operating mode:

- **NT Mode.** Kilomux provides the transmit clock for the "S" interface. The receive timing is recovered from the signal received from the user's terminal equipment.
- **TE Mode.** One of the "S" interface ports connected to the network termination (NT) unit must be selected as an external clock source for Kilomux. Thus the Kilomux nodal clock, and therefore the transmit timing of the "S" interface, are locked to the timing of the NT unit.

Sub Link Timing

The KVF.5 modules include a standard T1 or E1 sub link interface. The following timing options are available:

- **T1/E1 Line Signal.** The receive clock of the sub link is always derived from the incoming T1 or E1 line signal, and the transmit clock is derived from the nodal timing source of Kilomux.
- **Recovered Receive Clock.** The recovered receive clock of the sub link can be selected as the reference for the Kilomux nodal timing. If this option is not used, the equipment connected to the sub link must operate with loopback timing, or its timing must be locked to the same source that serves as the reference for the Kilomux nodal timing.

Main Link Interface Characteristics

V.35 Interface (Module KML.1)

The V.35 interface supports all the interface signals specified by ITU-T Rec. V.35. Note the following:

- The DTR signal is constantly ON as long as Kilomux is powered.
- The RTS signal is normally ON, except when a local main link loop is connected.
- The DSR and CTS signals are handled in accordance with user's selection:
  - When the DSR&CTS parameter is set to external, and the DSR and/or CTS signals are OFF, the transmit data line is continuously held at MARK.
  - When the DSR&CTS parameter is set to internal, the DSR and CTS signals are ignored (internally interpreted as being continuously ON).

RS-232 Interface (Module KML.2)

The RS-232 interface supports all the interface signals specified by EIA RS-232. Refer to the notes regarding the DTR, RTS, DSR and CTS signals presented for the V.35 interface.

V.36/RS-422/RS-530 Interface (Module KML.3)

The RS-530 interface supports all the interface signals specified by EIA RS-530, with the following exceptions:

- Refer to the notes regarding the RTS, CTS and DSR signals presented for the V.35 interface.
- The DTR signal is not supported. The line is used as ERC (external receive clock) output line.

X.21 Interface (Module KML.4)

The X.21 interface provides partial support for interface signals. The signals not fully supported are as follows:

- The C (control) signal is constantly ON.
- The I (indication) signal is used as follows:
  - When the I signal is ON, the interface operates normally.
  - When the signal is OFF, Kilomux sends a continuous MARK (binary "1") on the main link.

G.703 Codirectional Interface (Module KML.5)

The G.703 codirectional interface complies with all the requirements of ITU-T Rec. G.703 applicable to codirectional interfaces. This interface supports only data rates of 64 and 128 kbps.

Standard DDS CSU/DSU (Module KML.6)

The KML.6 main link interface complies with AT&T Pub. 62310: Standard Digital Data Service (DDS), Channel Interface Specifications. The interface supports data rates of 9.6, 19.2, and 56 kbps.

T1 Link Interface (Module KML.7)

The KML.7 module supports both the D4 (SF) and ESF framing formats, in accordance with user's selection. Zero suppression over the line is user-selectable (transparent (AMI) coding, B7ZS, or B8ZS).

The T1 line interface meets the requirements of AT&T TR-62411, ANSI T1.403, and ITU-T Rec. G.703, G.704. Jitter performance complies with the requirements of AT&T TR-62411.

E1 Link Interface (Module KML.8)

The E1 link interface meets the requirements of ITU-T Rec. G.703, G.704, and G.732, and supports both 256N and 256S multiframes (2 or 16 frames per multiframe, respectively), in accordance with user's selection. The KML.8 module also supports the CRC-4 option, including support for the E bit, as specified in ITU-T Rec. G.704, thereby allowing the carrier to monitor the link to Kilomux. CRC-4 use is user-programmable.

The KML.8 module uses the HDB-3 line code. Jitter performance complies with the requirements of ITU-T Rec. G.823. The module has two line interfaces: a 120Ω balanced interface, and a 75Ω unbalanced interface.

ISDN "S" Interface (Module KML.10/S)

The ISDN basic rate access "S" interface complies with ITU-T Rec. I.430. The interface operates at a nominal rate of 192 kbps, and carries two B data channels (nominal rate - 64 kbps), one D signaling channel (nominal rate - 16 kbps), and additional framing and maintenance overhead data. The line coding is 2B1Q. The line impedance is 100Ω. The user can select whether to connect or not the internal line termination of the module.

ISDN "U" Interface (Module KML.10/U)

The ISDN basic rate access "U" interface complies with the ANSI T1.601 and ETSI DTR/TM3002 standards. The line data rate is 160 kbps, and the line coding is 2B1Q. The utilization of the B and D channels is similar to that described above for the KML.10/S module. The line impedance is 135Ω.

IP Link Interface (Module KML.11)

The KML.11 main link module connects the KM-2100 directly to a LAN or an Ethernet based backbone. The KML.11 takes the TDM bit stream delivered over the KM-2100's back plane and converts it into IP frames..

Fiber-Optic Link Interface (Module KML.F)

The fiber-optic link interface of the KML.F module uses a proprietary signaling format which ensures optimum performance. To optimally meet a wide range of system requirements, the fiber-optic interface can be ordered for operation over 62.5/125 micron multi-mode fibers (typical attenuation - 3.5 dB/km), as well as over low-loss 9/125 micron single-mode fibers (typical attenuation - 0.4 dB/km).

Each option can be ordered with ST or FC-PC connectors; SMA connectors are also available at 850 nm.

Table 1-4 provides information on the characteristics of the optical interface. Typical range is up to 4.5 km at 850 nm over multimode fiber, up to 45 km at 1300 nm over single-mode fiber with LED transmitters, up to 60 km with 1300 nm laser transmitters, and up to 100 km with 1550 nm laser transmitters.

Table 1-4. KML.F Fiber-Optic Interface Characteristics

Wavelength	Fiber Type	Transmitter Type	Power Coupled into Fiber	Receiver Sensitivity	Optical Budget	Maximum Receiver Input Power	Receiver Dynamic Range
850 nm	62.5/125 µm multi-mode	LED	-18 dBm	-38 dBm	20 dB	-10 dBm	28 dB
1300 nm	9/125 µm	LED	-18 dBm	-40 dBm	22 dB	-12 dBm	28 dB
	single-mode	Laser	-12 dBm	-40 dBm	28 dB	-12 dBm	28 dB
1550 nm	9/125 µm single-mode	Laser	-12 dBm	-40 dBm	28 dB	-12 dBm	28 dB

1.4 I/O Module Applications

There are many applications for the different Kilomux I/O modules. For details, refer to the corresponding sections of the I/O modules in Part II of this manual.

1.5 Technical System Characteristics

Main Link

Number of Main Links	Kilomux-2100: 1 or 2 Kilomux-2104: 1
Multiplexing Technique	Time Division, Bit Interleaved
Multiplexing Efficiency	Typically 98.5%
Bit Rates (dependant on KML type)	9.6, 14.4, 19.2, 32, 48, 56, 64, 128, 192, 256, 384, 512, 768, 1024, 1536 kbps
Interface & Connector Type	
KML.1 Module	V.35, 34-pin female connector
KML.2 Module	V.24/RS-232, 25-pin D-type female connector
KML.3 Module	V.36/RS-422/RS-530, 25-pin D-type female connector
KML.4 Module	X.21, 15-pin D-type female connector
KML.5 Module	G.703 codirectional, RJ-45 (8-pin) connector
KML.6 Module	Standard DDS, RJ-48 (8-pin) connector
KML.7 Module	T1 link, 100Ω balanced, RJ-45 (8-pin) connector
KML.8 Module	E1 link, 120Ω balanced, RJ-48 (8-pin) connector E1 link, 75Ω balanced, two BNC connector
KML.10/S Module	S-type interface, 100Ω balanced, RJ-45 (8-pin) connector
KML.10/U Module	U-type interface, 135Ω balanced, RJ-45 (8-pin) connector
KML.11 Module	10BaseT/100BaseT RJ-45 (8-pin) connector 10BaseF/100BaseF MTRJ/LC
KML.F Module	Fiber-optic (850 mm), ST, SMA or FC/PC connector Fiber-optic (1300 mm, 1550 mm), ST or FC/PC connector

Control Signals		
RS-232 & V.35	Full local support of all control signals	
V.36	Full local support of all control signals, with the exception of RI	
X.21	Local support of C and I	
Clock Modes		
KML.1, KML.2, KML.3, KML.4	DTE, External DCE and DCE	
KML.5, KML.6	Internal and Loopback	
KML.7, KML.8, KML.F	Internal, Loopback and DCE	
KML.10	DTE	
KML.11	Adaptive, Internal and DCE	

Equipment Enclosure

	Kilomux-2100	**Kilomux-2104**
Physical Description	18 slot card cage	4 slot card cage
Slot Use	2 power supply slots 2 main link slots 1 common logic slot 1 optional slot 12 I/O slots	Built-in power supply Built-in main link Built-in common logic 0 optional slots 4 I/O slots
Dimensions	19” rack mount, front-mounting or standalone unit	
Height	13.26 cm/5.22 in (3U)	4.4 cm/1.75 in (1U)
Width	43.7 cm/17.20 in	43.0 cm/17.30 in
Depth	25.25 cm/9.94 in	25.4 cm/10 in
Power Requirements		
Supply Voltages	100 to 240 VAC (±10%), 50/60 Hz	100 to 240 VAC (±10%), 50/60 Hz
	-24 VDC or -48 VDC	-24 VDC or -48 VDC
Maximum Power Consumption	200 VA (for AC)	40 VA (for AC)

Environment

Operating Temperature	32 to 104°F (0 to +40°C)
Storage Temperature	0 to 160°F (-20 to -70°C)
Humidity	Up to 90%, non-condensing

Management

LED Indicators	Main link and power supply on line
	Main link TX and RX
	Selectable I/O channel TX and RX
	Selectable I/O channel control Data: RTS and DCD Voice: E-lead and M-lead
	Local sync
	Remote sync
	Alarm indication
	Test in progress
Supervision Port Connector	Asynchronous RS-232 or Hayes™ compatible dial-up modem interface
Data Rates	9.6, 19.2, 38.4, 57.6 kbps
	For ASCII terminal connection: 9.6 kbps only
Word Format	7/8 bit, even/odd/no parity, 1 stop bit format
Interface Type	DTE or DCE
Connection Type	9-pin female D-type
Dial Port Connector	9-pin female D-type
Ethernet Port	UTP or BNC Ethernet connector
RADview Management System Interface	Provides complete control, configuration and monitoring
	Automatic recognition of all modules and their status
	Three level security access administration
	Alarm/event recording

Diagnostics

	Power-up self-test
	Continuous self-test during normal operation
	Link test when configuration downloading is invoked
Main Link Tests	Local loopback
	Remote loopback
	Loop 2 and loop 3 on main link modem as defined in ITU-T Rec. V.54
I/O Channel Tests	Local loopback
	Remote loopback
	Pseudo-random sequence transmission test (511-bit pattern)
	BERT (bit error rate test using 511-bit pattern pseudo-random sequence)
	ITU-T Rec. V.54 loop 2 and loop 3 by interface connector pins
	Tone injection for voice modules
Alarms	LCD alarm buffer: stores one alarm of each type
	Supervision terminal alarm buffer: stores the last 100 alarms. Each alarm time and date stamped
ALM RLY connector	RJ-12 connector For pinout refer to *Appendix A*.
Dial Port connector	9-pin female connector
	Direct connection to dial up modem For pinout refer to *Appendix A*.

Chapter 2
Installation

2.1 Introduction

This chapter provides installation and setup instructions for the Kilomux enclosure and for the modules that are part of the basic system configuration. The information in this chapter includes:

- The site requirements and prerequisites necessary for installing Kilomux
- The equipment needed to run Kilomux
- The contents of the Kilomux package
- The installation and setup of the Kilomux system
- The various Kilomux interfaces and connection instructions
- The initial setup and configuration of the Kilomux system.

After installing the Kilomux system, it is necessary to configure the system in accordance with the specific user's requirements. Refer to the *Configuring Kilomux* chapter.

After the preliminary configuration, the system can be managed by means of the RADview-PC network management station offered by RAD. Refer to the *User's Reference Manual* of the network management station for operating instructions.

In case a problem is encountered, refer to the *Diagnostics* chapter for test and diagnostics instructions.

Warning

No internal settings, adjustment, maintenance, and repairs may be performed by either the operator or the user; such activities may be performed only by a skilled technician who is aware of the hazards involved. Always observe standard safety precautions during installation, operation, and maintenance of this product.

2.2 Site Requirements and Prerequisites

Input Power Requirements

For AC operation, the Kilomux unit should be installed within 1.5m (5 feet) of an easily accessible grounded AC outlet capable of furnishing the mains voltage of the ordered KPS module. KPS.4 and KPS.6 modules of Kilomux-2100 and the AC power supply of Kilomux-2104 can operate on AC supply voltages in the range of 100 to 240 VAC, at input frequencies of 47 through 440 Hz. The maximum input current varies with the input voltage.

For DC operation, the Kilomux unit should be connected to a -48 VDC or -24 VDC source (in accordance with the nominal voltage of the ordered KPS module) through a circuit breaker. The DC source must comply with the requirements of EN60950.

Grounding

Warning

For your protection and to prevent possible damage to equipment when a fault condition, e.g., lightning stroke or contact with high-voltage power lines, occurs on the lines connected to the equipment, the case of the Kilomux unit must be properly grounded at any time. Any interruption of the protective (grounding) connection inside or outside the equipment, or the disconnection of the protective ground terminal can make this equipment dangerous. Intentional interruption is prohibited.

Before switching on this equipment and before connecting any cables, the protective ground terminals of the equipment must be connected to a protective ground. The grounding arrangements depend on the equipment power supply source:

- AC-powered units: the grounding connection is made through the mains plug, which must be inserted in a power socket (outlet) with protective ground contact. Do not negate the protective ground contact by using an extension cord (power cable) without a protective conductor (grounding).
- DC-powered units: the grounding connection is made through one of the pins of the DC power connector.
- In addition, all units/PS modules have a grounding terminal: connect it to the nearest grounding point using a short, wide copper braid (or a thick copper wire).

Whenever possible, the Kilomux units should be installed in a properly grounded rack, connected to a reliable, low-resistance grounding system.

Channel Connection Considerations

Special cables can be ordered to connect the Kilomux main link and I/O modules either directly to the user equipment, or via a main distribution frame. T1 and E1 interfaces of Kilomux modules must not be connected directly to the telecommunication network. The connections must be made through a network termination unit that provides separation between the interface conductors and the telecommunication network conductors in accordance with the applicable local regulations.

When a Kilomux module with T1 interface connects to a system that requires compliance with DSX-1 requirements, the distance between the module and the DSX-1 unit (assuming 22 AWG pairs) should not exceed 200 m (655 ft).

Front and Rear Panel Clearance

Allow at least 90 cm (36 inches) of frontal clearance for operator access. Allow the same clearance at the rear of the unit for interface cable connections and module replacement.

Ambient Requirements

The range of ambient operating temperatures of Kilomux is 32 to 104°F (0 to +40°C), at a relative humidity of up to 90%, non-condensing.

Kilomux is cooled by free air convection. Its cooling vents are located in the top and bottom covers.

Caution To prevent overheating, do not obstruct the Kilomux cooling vents and make sure enough free space is available below, and above, Kilomux, to permit free air flow. When Kilomux is installed in a 19" rack, allow at least 1U of space below and above the unit.

Electromagnetic Compatibility Considerations

Kilomux is designed to comply with the electromagnetic compatibility (EMC) requirements of Sub-Part J of FCC Rules, Part 15, for Class A electronic equipment.

To meet these standards, it is necessary to perform the following:

- Connect the Kilomux unit to a low-resistance grounding system.
- Install blank panels to cover all empty slots. Appropriate blank panels can be ordered from RAD. Refer to the latest *Product Catalog, Catalog No. 801529*.

Current and Power Requirements of Kilomux Power Supply Modules

Kilomux power supplies provide supply voltages of +5V, +12V, and -12V. *Table 2-1* lists the power requirements of the Kilomux modules.

Table 2-1. Power Consumption of Kilomux Modules

I/O Module	+5 VDC Power Consumption [Watts]	+12 VDC Power Consumption [Watts]	-12 VDC Power Consumption [Watts]
KLS.1	0.26	0.36	0.216
KLS.1/NEW	0.25	0.36	0.24
KLS.2	0.41	0.264	0.072
KHS.1	0.8	0.78	0.084
KHS.1/V.35	0.8	0.78	0.12
KHS.2	1.055	0.912	0.084
KHS.703	0.8	–	–
KHS.U	2.0	–	–
KVC.1/E&M	0.875	–	0.18
KVC.1/FXS	1.15	–	0.396
KVC.1/FXO	0.875	–	0.06
KVC.1M/FXS	1.6	–	0.72
KVC.1M/FXSP	2.45	–	0.84
KVC.1M/FXO	1.05	–	0.3
KVC.1M/E&M	1.5	–	0.36
KVC.1M/FXS/CAN	2.1	–	0.72
KVC.1M/FXSP/CAN	2.95	–	0.84
KVC.1M/FXO/CAN	1.55	–	0.3
KVC.1M/E&M/CAN	2.25	–	0.36
KVC.3/FXO	2.5	–	0.3
KVC.3/E&M	2.5	–	0.24
KVC.3/FXS	3	–	1.2
KVC.3/FXSP	5	–	1.308
KVC.3M/S0	3.1	–	0.25
KVF.3/E&M	2.2	0.12	0.6
KVF.3/FXS	3.1	0.06	0.84
KVF.3/FXSP	3.25	0.12	0.96
KVF.3/FXO	2.3	0.12	0.54
KVF.4/FXS	4	–	0.72
KVF.4/FXSP	7.5	–	1.8
KVF.4/E&M	4.1	–	0.72

I/O Module	+5 VDC Power Consumption [Watts]	+12 VDC Power Consumption [Watts]	-12 VDC Power Consumption [Watts]
KVF.4/FXO	4	–	0.6
KVF.4/FXSW	4.75	–	0.48
KVF.4/S0	4.5	–	0.24
KVF.5/MASTER	7.75	–	0.6
KVF.5/SLAVE	6.75	–	0.6
KVF.6/E1/16	4.9	–	–
KVF.6/E1/31	6.9	–	–
KVF.6/T1/12	4	–	–
KVF.6/T1/24	5.6	–	–
KVF.8/E&M	5.6	.048	0.44
KVF.8/FXO	6.72	.048	0.44
KVF.8/FXS	5	1.7	0.44
KTRE	4.25	0.24	0.24
KMBE	2.45	0.96	–
KMBE/N	2.45	0.96	–
KCL.1	0.375	0.06	0.036
KCL.1/N	0.5	0.156	0.042
KCL.2	1.95	0.02	0.042
KAI	0.325	0.012	–
KDI	1.1	–	–
KML.1 (V.35)	1.125	0.42	0.012
KML.2 (V.24)	1.125	0.42	0.012
KML.3 (V.36)	1.125	0.42	0.012
KML.4 (X.21)	1.125	0.42	0.012
KML.5 (G.703)	1.75	–	–
KML.1,2,3,4/N	1.35	0.4104	0.0576
KML.5/N (G.703)	2	–	–
KML.6/N	1.6	0.42	–
KML.7/N	2	0.42	–
KML.8/N	2.05	0.42	–
KML.10/N	2.5	0.42	–
KML.11	3.5	–	–
KML.11/F	3.5	–	–
KML.F/ST13	3.4	–	–
KML.F/ST85	3.35	–	–

Current and Power Capabilities of Kilomux Power Supply Modules

The following table lists the power that can be provided by the individual Kilomux power supply modules when cooled by free air connection.

Table 2-2. Nominal Power Consumption of Power Supply Modules

Module	+5V Output	+12V Output	-12V Output	Maximum Total Power Per Module
	Power [W]	Power [W]	Power [W]	[W]
KPS.3, KPS.5	15.5	4.8	4.8	25
KPS.4	30	12	9.6	50
KPS.6	55	10.2	10.2	56
KPS.7	55	10.2	10.2	56
KPS.8	120	24	18	130
Kilomux-2104/AC	30	7.2	7.2	30
Kilomux-2104/48	40	7.2	7.2	40

Note

- *Power supply modules of the Kilomux-2100 have load-sharing capabilities. By installing two KPS modules it is possible to double the allowed loading.*
  If the power requirements exceed the capabilities of a single power supply module, you cannot consider that the two modules are providing redundancy. Any failure must be immediately corrected.
- ***KPS.4***
  The nominal output power specified for the KPS.4 module can be safely exceeded to the following maximum output power:
  +5V 40W
  +12V 18W
  –12V 12W
  The total power supplied by the module CANNOT exceed the Maximum Total Power Per Supply of 50W.
- ***KPS.6, KPS.7***
  The +5V output must always be loaded.
  The minimum current consumption from the +5V output is 3A (15W). If a lower current is needed, use a power supply module with lower output currents.
  With forced air-cooling, the Maximum Total Power of the module can reach up to 80W.
- ***KPS.8***
  no minimal load is required.
  24VDC-AC Redundancy (KPS.5 co working with KPS.8) is ***not possible****.*
  48VDC-AC Redundancy (KPS.3/7 co working with KPS.8) is ***possible (yet not recommended)*** *for KPS.7 with preliminary factory calibration.*

Calculating Allowable Power Consumption

Use the following procedure to determine whether a Kilomux power supply module can provide the power and current requirements of the modules installed in the enclosure:

1. For each voltage category, add the Power Consumptions of all the modules to be installed (take values from *Table 2-1*).
   Example: To install KVF.8/FXS, KML.1 and KCL.2, the +5V consumption needed is 8.075W, +12 is 0.457W, -12 is 0.494W.
2. Check that the total power consumption for each voltage does not exceed the nominal power consumptions for the chosen power supply. (For KPS.4, KPS.6 and KPS.7 refer to the note above.)
   Example: For KPS.5:
   8.075W ≤ 15.5? Yes
   0.457W ≤ 4.8? Yes
   0.494W ≤ 4.8? Yes
3. Add together all three power consumptions (per voltage) for the given application and check that the total power consumption per power supply does not exceed the Maximum Total Power Per Supply. (For KPS.4, KPS.6 and KPS.7 refer to the note above.)
   Example:
   9.026 ≤ 25? Yes

If any one of the power supply consumption ratings (per voltage or per Maximum Total Power Per Supply) is exceeded, use one of the following methods.

The following methods are arranged in decreasing order of preference. If any method corrects the power supply current ratings, there is no need to proceed with the other methods.

- **Method 1** - If you are using a Kilomux-2104, exchange it for a Kilomux-2100. If you are using a Kilomux-2100, install the KPS.6 module. A single KPS.6 module can meet the supply requirements of most practical configurations.
- **Method 2** - Install an additional KPS module, to share the load.
- **Method 3** - Split the modules between two Kilomux enclosures (consider using a Kilomux-2104 if you need no more than four additional modules). You may also try to use an external ringer to supply necessary ring voltages instead of deriving the ring voltage from the installed power supply modules (in cases of FXSP voice modules).

Ratings of Ring and Feed Voltage Supplies

RAD offers two special-purpose power supply units that can provide DC battery feed and ringdown voltages for the voice modules used with Kilomux, e.g., KVC.1M, KVF.4, KVF.8, etc. These power supply units are independently powered and do not draw current from the KPS modules installed in Kilomux.

Ringer-2000

Ringer-2000 is a standalone power supply unit that can provide power for up to 60 voice channels. Ringer-2000 is intended for installation on shelves or in 19" racks. Unit height is only 1U. Ringer-2000 is available in AC (115 VAC or 230 VAC) or DC (-24 VDC or -48 VDC) power supply versions.

Ringer-2200

Ringer-2200 is an enhanced standalone power supply unit that can provide power for up to 120 voice channels. This is enough power for a Killomux-2100 chassis fully equipped with 12 KVF.8 modules (96 channels). Ringer-2200 is intended for installation on shelves or in 19" racks. Unit height is only 1U. Ringer-2200 is available in 115 VAC or 230 VAC power supply versions.

KM-Ringer

KM-Ringer can provide power for up to 32 voice channels (or 24 KVF.8 channels). KM-Ringer is a small unit that can be located on shelves and desktops, or installed as a plug-in module in a Kilomux-2100 enclosure only. It occupies three I/O enclosure slots. KM-Ringer is available in AC (115 to 230 VAC) or DC (-24 VDC or -48 VDC) power supply versions.

For details see the appropriate *Ringer Installation and Operation Manual*.

2.3 Equipment Needed

The following describes the equipment needed to run the Kilomux.

Terminal Characteristics

Any standard ASCII terminal or PC emulating an ASCII terminal equipped with an RS-232 communication interface can be used to control Kilomux operation. Make sure to initialize Kilomux for correct terminal operation as explained in *Initial Setup and Configuration* on page 2-21, otherwise some commands may not work properly.

Software Requirements

The software necessary to run the Kilomux supervision program is contained in the program EPROM of the KCL.2 module of the Kilomux. Kilomux stores all the configuration information generated or altered during the communication with the terminal. No information is stored in the terminal.

Supervisory Port Interface Characteristics

Kilomux has an RS-232 asynchronous DCE port, designated Supervisory Port Connector (CONTROL-DCE), located on the KCL.2 module. This port has a 9-pin D-type female connector, and is intended for direct connection to terminals. Since terminals usually have DTE interfaces, the connection to this port is made by means of a straight-through cable. For connection to a modem, you need a cross-cable (null modem cable).

The user can select, for each port, the data rate (9.6, 19.2, 38.4, 57.6 kbps), and the word format (number of data bits, parity type, and number of stop bits). The default communication data rate is 9.6 kbps. The default word format consists of one start bit, eight data bits, no parity, and one stop bit.

The SP (CONTROL-DCE) supervisory port continuously monitors the incoming data stream and will immediately respond to any input string received through this port; moreover, when configured to support management by RADview, messages in the RADview protocol are automatically identified and processed.

Connection of Supervision Terminal

A supervision terminal can be connected either directly to the Kilomux SP (CONTROL-DCE) supervisory port, or through a modem or any other type of full-duplex data link. Kilomux supports only a dial-in connection.

Handshaking Protocol - CONTROL DCE Port

The handshaking between Kilomux and the equipment connected to it (supervision terminal, RADview management station, modem, etc.) uses the control lines in the Kilomux SP connector.

The control lines being used in the DCE and DTE interfacing mode, and the direction of the control signals, are detailed in the following chart.

Table 2-3. DCE and DTE Interfacing Mode - Control Lines

Control Line	Interface Type	
	DCE	**DTE**
CTS	Out	Not used
DCD	Out	Out
DSR	Out	Out
DTR	In	In
RI	Not used	In
RTS	In	In

Data Terminal Ready (DTR)

The equipment connected to the SP port must set the DTR line ON (active) to gain control over Kilomux and start a management session. When the DTR is ON, the Kilomux front panel controls are disabled, and the LCD shows: `TERMINAL ON LINE`.

To end the current session, the DTR line is switched OFF (inactive). This ends the control connection, and returns the control to the Kilomux front panel. If password protection is used, the password must be entered again the next time the DTR line is switched ON to start a new session.

Request to Send (RTS)

The RTS line is normally ON (active) during a management session.

When the RTS line is OFF (inactive), Kilomux interprets any data received from the terminal on the TD line as MARK.

Clear to Send (CTS)

The state of the CTS line is determined by the CTS parameter:

- **ON** - The CTS line is always ON (active)
- **=RTS** - The CTS line follows the RTS line.

Data Carrier Detect (DCD)

The state of the DCD line depends on the communication address (node number):

- When the node address is 0, the DCD line is always ON (active).
- When a non-zero node address is used (multidrop operation), the DCD line is switched ON (active) when data is detected on the RD line, provided Kilomux recognizes its own address in the data stream. To simulate DTE operation, the delay between these events can be set by the user (by means of the DCD_DEL parameter).

Ring Indication (RI)

The RI line is used only with dial-up modems (DTE interface mode).
The RI line is normally OFF (inactive); when the modem attached to the Kilomux SP connector detects an incoming call, the RI line is switched ON (active). See also the DSR line.

Data Set Ready (DSR)

- Usually, the DSR line is configured to track the DTR line. In this case, if the supervisory port interface is DTE, the DSR line will be switched ON for 5 seconds when the RI line is ON while the DTR line is OFF.
- If the supervisory port interface is DCE, the DSR line can also be configured to be continuously ON. However, if the DTR line switches to OFF, the DSR line will also switch to OFF for 5 seconds.
  In addition, Kilomux always switches the DSR line OFF (inactive) for 5 seconds when the EXIT command is executed, and when the disconnect time-out expires.

AUTOBAUD Function

When the AUTOBAUD function is enabled, Kilomux can identify the rate of incoming data by analyzing the timing of three consecutive pairs of Carriage Return and Line Feed characters (generated by pressing three times the carriage return key). The detected data rate is then used for the current communication session. The automatic baud rate identification procedure is performed (or repeated) whenever three consecutive carriage returns are received after one of the following events occurs:

- The DTR line has been switched OFF
- The EXIT command has been executed
- The idle disconnect time-out expired because no data has been exchanged with the supervision terminal.

In case one of these events occurred, Kilomux assumes that the current communication session has been terminated. Therefore, when the password protection is enabled the password must be entered again before the supervision terminal can resume communication with Kilomux.

The AUTOBAUD function cannot be used with the RADview station, and therefore when RADview management is disabled, you must turn off AUTOBAUD.

Handshaking Protocol with Dial-up Modem

The handshaking procedure between Kilomux and a dial-up modem uses the control signals in the optional MNG connector, and is essentially similar to the handshaking with a terminal. The difference is that the directions of the control signals are reversed relative to their direction in the SP (CONTROL DCE) connector when the SP interface is set to DCE. The control lines and the direction of the control signals in the MNG connector is detailed in the following chart.

Table 2-4. MNG Connector - Control Lines

SP (CONTROL DTE) Control Line	Direction
CTS	In
DCD	In
DSR	Out
DTR	In
RI	In
RTS	Out

2.4 Package Contents

The Kilomux package includes the following items:

- Kilomux
- Power cable
- WAN connectors
- Optional I/O modules
- Kilomux Installation and Operation Manual.

2.5 Installation and Setup of Kilomux

To install a Kilomux-2100, refer below to *Kilomux-2100*. To install a Kilomux-2104, refer below to *Kilomux-2104*.

Kilomux-2100

Kilomux-2100 is intended for installation on shelves and racks. Do not connect power to the enclosure before it is installed in the designated position.

For rack installation, it is necessary to install two brackets to the sides of the unit (*Figure 2-1*). As illustrated below, you may install the brackets in two ways, to orient the unit in accordance with your requirements (either with the Kilomux-2100 front panel toward the front of the rack, or the module panels toward the front).

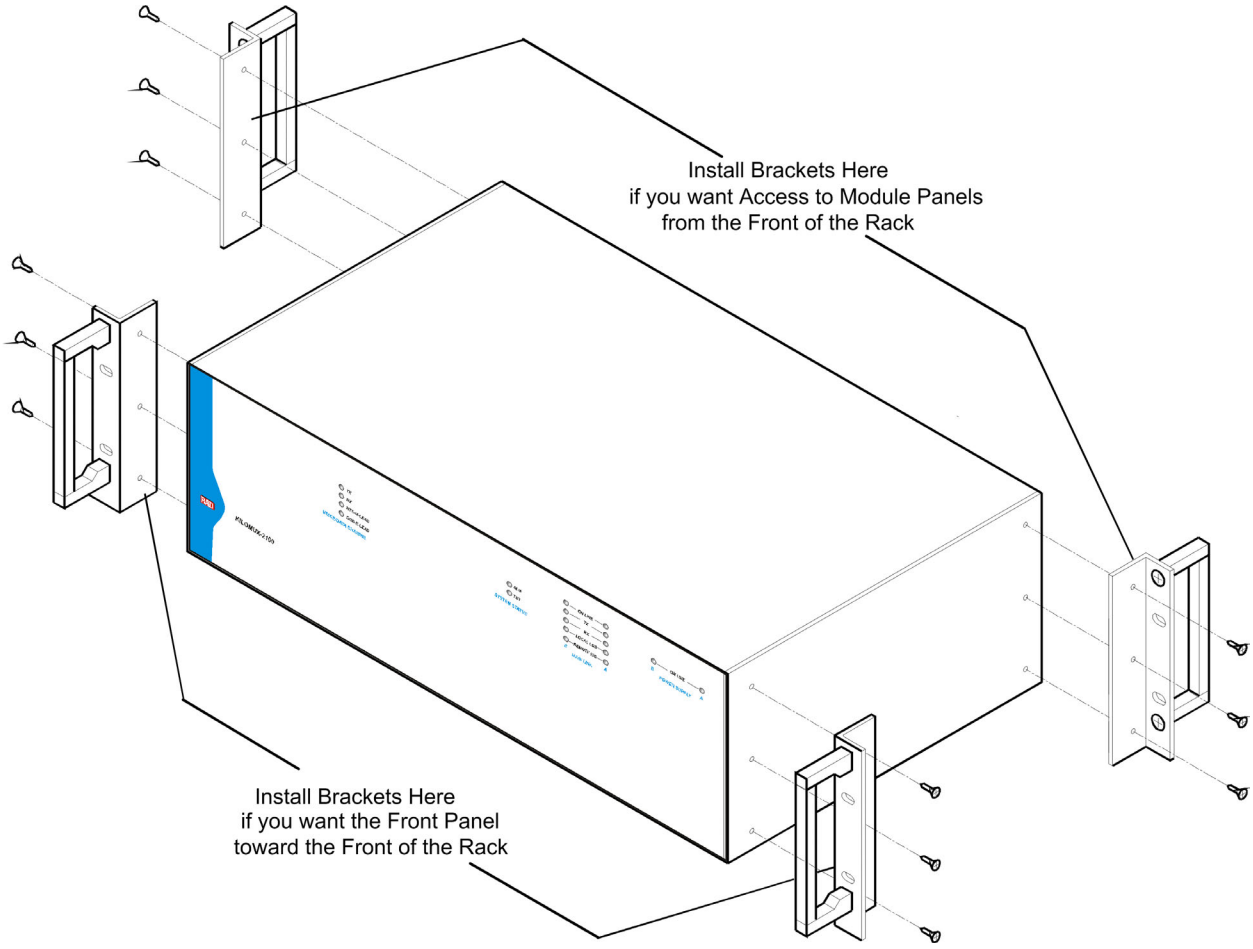

Install Brackets Here
if you want Access to Module Panels
from the Front of the Rack
Install Brackets Here
if you want the Front Panel
toward the Front of the Rack

Figure 2-1. Attachment of Brackets

After attaching the brackets, fasten the enclosure to the rack by four screws (two on each side).

After fastening the enclosure, install the required modules and set the jumpers and switches. Refer below to *KPS Module*.

Kilomux-2104

The Kilomux-2104 is intended for 19" rack installation. Before installing the enclosure, check whether the required I/O modules are in place, in accordance with the installation plan.

The enclosure is fastened to the rack by four screws (two on each side). Do not connect power to the enclosure before it is installed in the designated position.

KPS Module

Setting the Internal Jumpers

The KPS modules include one internal jumper, designated **FG=SG**. The location of the jumper is shown in *Figure 2-2*. This jumper controls the connection between the internal signal ground and the frame (enclosure) ground. The module is delivered with the jumper set to **YES.** Set the jumper to **NO** if you need the signal ground to float with respect to the frame ground. If redundant modules are installed, make sure that the jumper is set to the same position on both modules.

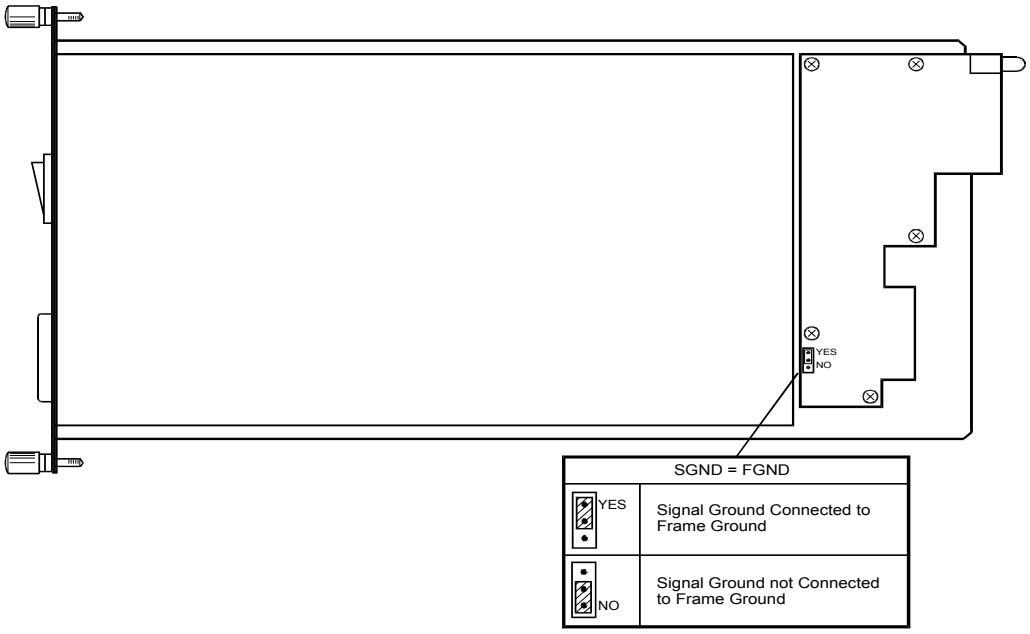


Figure 2-2. Typical KPS Module, Location of Internal Jumper

Installing the KPS Module

➤ **To install the KPS module:**

1. Insert the KPS module in slot 1.
2. If an additional redundant module is used for Kilomux-2100 only, install it in slot 2. For example, a KPS.7 module can be used as a backup to an AC power supply module with similar rating, e.g., KPS.6.

Note *You can install a redundant module in an operating enclosure without turning off the enclosure power. In this case, after the module is installed, connect its power cable and set its power switch to ON.*

KCL.2 Module

Setting the Internal Switches and Jumpers

The KCL.2 module has two four-section DIP switches, and three user-selectable jumpers. Their locations are shown in *Figure 2-3*. ***Error! Reference source not found.*** describes switch and jumper functions.

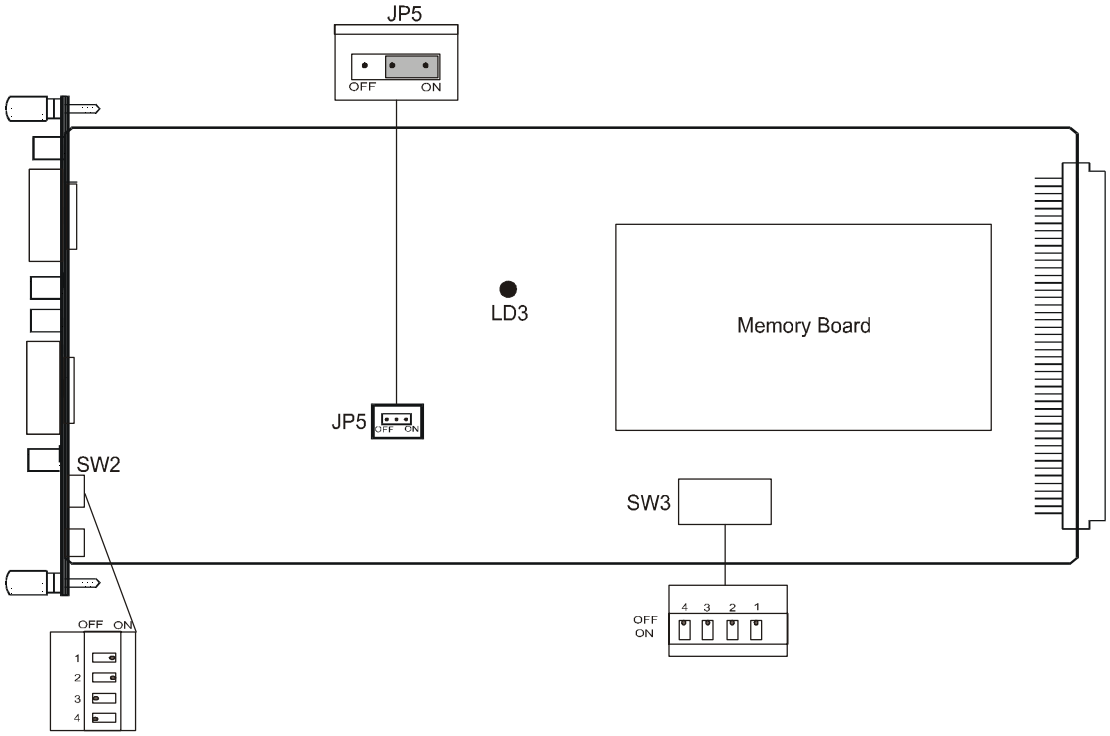


Figure 2-3. Module KCL.2, Internal Switch and Jumpers

Note *In addition to the switches and jumpers described in this section, the KCL.2 module has other switches and jumpers that are set by the manufacturer and may not be changed by the user.*

Table 2-4. Module KCL.2, Internal Switch and Jumper Functions

Item	Function
Jumper JP5	Enables /disables the internal watchdog function during maintenance
	ON - watchdog enabled (normal operation)
	OFF - watchdog disabled
	Default: ON
Switch SW2	(Switch is externally accessible from the panel)
1	Determines whether the Supervisory Port is used as a direct terminal or for a SLIP connection: ON - direct terminal OFF - SLIP connection SP Parameters: 9600 bps, 8,1,N
2	Currently not in use
3	Local basic software download: OFF - normal function ON - download software
4	For debugging purposes. Should always be set to OFF
Switch SW3	
1	Not in use. Should always be set to OFF
2	Database initialization. Should always be OFF
3	Determines whether Kilomux requires a password when working with a terminal: ON - requires password OFF - does not require password
4	Not in use. Should always be set to OFF

Note

For Kilomux-2104, the access to DIP Switch SW3 is through a hole in the upper cover.

Note

You should load the default supervisory port password and communication parameters (by setting sections 2 and 3 of DIP Switch SW3 to ON) if the current parameters are not known, and the supervision terminal cannot communicate with the Kilomux enclosure. In such a case, first make sure the supervision terminal is set for the correct parameters.

Installing the KCL.2 Module

Install the KCL.2 module in slot 5 of Kilomux-2100.

2.6 Interfaces and Connections

Warning

BEFORE SWITCHING ON THIS INSTRUMENT, the protective earth terminals of this instrument must be connected to the protective ground conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding).
Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this instrument dangerous. Intentional interruption is prohibited.
Make sure that only fuses of the required rating, are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders is forbidden.
Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

KPS Module

Warning

HIGH VOLTAGE: Dangerous voltages are present inside the KPS module when it is connected to power. Do not connect the KPS module to power before it is properly installed within the Kilomux enclosure, and disconnect the input power from the module before removing it from the enclosure. The installation and preparation of the module shall be done by a qualified person who is aware of the hazards involved.

Rear Panels

The rear panels of the various types of KPS modules are shown in *Figure 2-4*. The following table also lists the functions of the components located on these panels.

Table 2-5. KPS Modules, Rear Panels

Item	Description
POWER Switch	Turns the power on/off. Lights when the input voltage is connected.
Label	Indicates the nominal mains operating voltage of the module and the fuse rating
Power Connector (with integral fuse for KPS.4, and KPS.6 only)	Connector for the module input power voltage: KPS.3 and KPS.7: -48 VDC KPS.4, KPS.6, KPS.8: 100 to 240 VAC KPS.5: -24 VDC

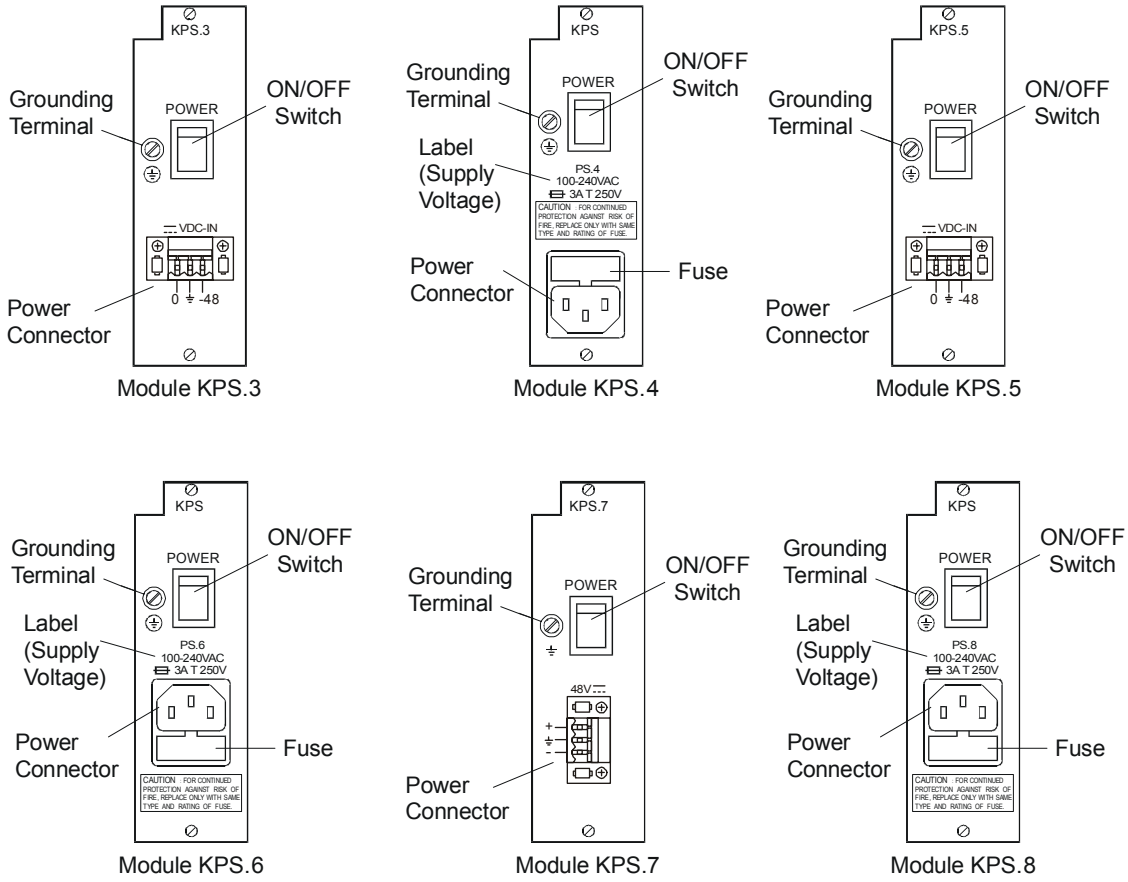


Figure 2-4. KPS Modules, Rear Panels

Power Connection

1. Check that the ON/OFF switches on the KPS modules are set to OFF. Refer to *Figure 2-4*.
2. Connect the power cable first to the connector on the KPS module, then to the mains outlet. Refer to *Figure 2-4*.

Note *When redundant power supplies are used, it is recommended to connect the power cables to outlets powered by different circuits.*
The KPS.3 and KPS.5 modules do not have a power switch, and will start operating as soon as power is connected.

KCL.2 Module

Rear Panel

Figure 2-5 shows the rear panels of the KCL.2 module. The KCL.2 is ordered with one of the following three Management Port interfaces:

- 9-pin Dial Port
- UTP Ethernet interface
- BNC Ethernet interface.

Table 2-6 describes the functions of the panel components.

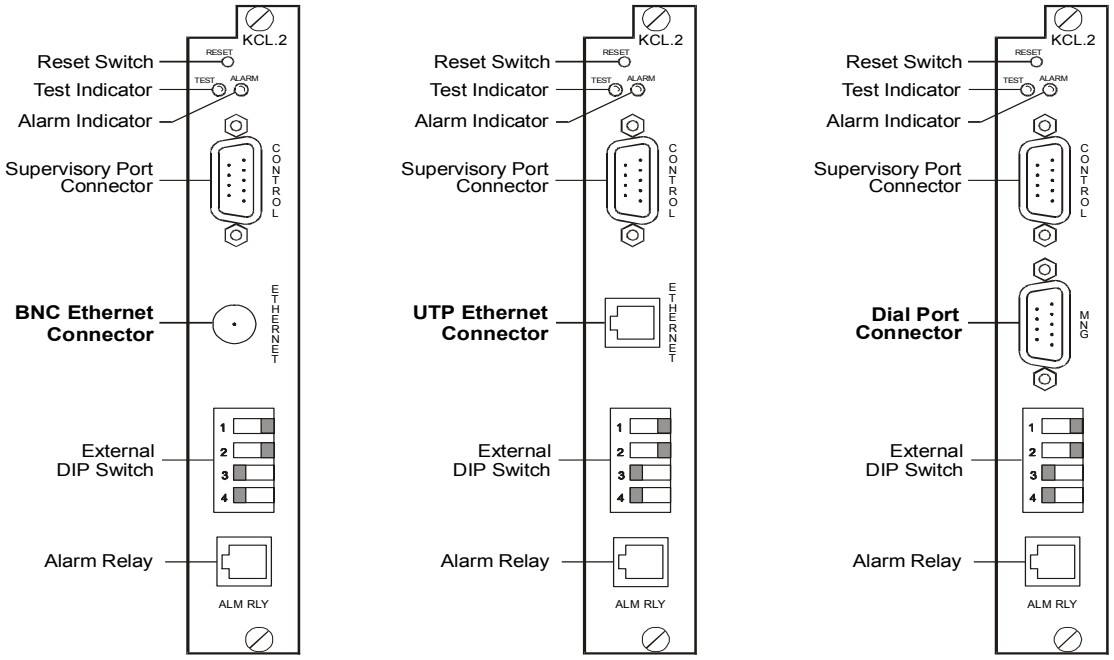


Figure 2-5. Module KCL.2, Rear Panel

Table 2-6. Module KCL.2, Rear Panel

Item	Function
RESET Push-button	Pressing the RESET push-button causes the reinitialization of all the modules in the Kilomux enclosure
TEST Indicator	Indicates that a test (or test loop) is being performed on one of the local Kilomux modules, or on the main link modem. When downloading is activated, the TEST indicator lights when a test is activated by the remote Kilomux modules
ALARM Indicator	Indicates that a fault has been detected in one of the Kilomux modules
CONTROL (Supervisory Port) connector	9-pin D-type female connector, for connection to an optional ASCII supervision terminal or to a RADView network management station. Connector pin allocation is given in *Appendix A*
MNG/ETHERNET connector	One of the following, according to Management Port interface option ordered: • 9-pin D-type female connector used as a Dial Port (dial-in/dial-out) • UTP connector to an Ethernet network • BNC connector to an Ethernet network. Connector pin allocation is given in *Appendix A*
External DIP switch (SW2)	Described in ***Error! Reference source not found.***
ALM RLY connector	6-pin RJ-12 connector with dry contacts for relaying alarms from the Kilomux to activate external equipment (such as lamps, buzzers, fans). The Alarm Relay connector can also be used to relay external equipment information to the Kilomux (such as external sensor information, or fan failure). Connector rating: Max current is 500 mA, Max voltage is 50V For pinout refer to *Appendix A*.

Connections to the Supervisory Port – KCL.2 Module

Find the supervision cable intended for connection to the enclosure, and connect it to the SP connector on the KCL.2 module.

If the optional dial-out port is to be used, connect the corresponding cable to the MNG connector on the KCL.2 module.

Connections to the Alarm Relay Connector – KCL.2 Module

Connect the external equipment to the RJ-12 Alarm Relay connector according to the pin assignment described in *Appendix A*.

The connector functions as a dry contact relay. Under normal conditions, the Normally Closed (NC) pin is shorted with the Common contact. When a Kilomux alarm occurs, the Common contact will instead be shorted to the Normally Open (NO) pin and the device connected to the connector will be activated (similarly to how the Alarm LED on the Kilomux front panel is activated).

Connections to KML, Options, I/O Modules, and Ringers

Refer to the corresponding module/ringer Installation and Operation Manual.

Kilomux-2104

Rear Panel

Figure 2-6 shows a typical rear view of the Kilomux-2104 enclosure and identifies the I/O slots.

Table 2-7 explains the components located on the Kilomux-2104 rear panel.

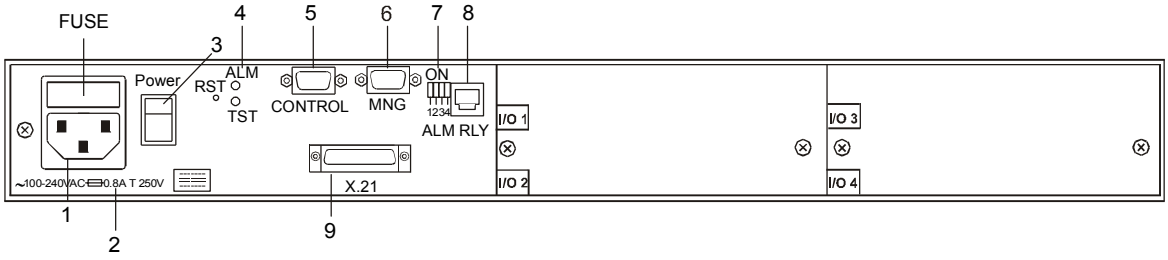


Figure 2-6. Kilomux-2104 Enclosure, Typical Rear View

Table 2-7 Kilomux-2104, Rear Panel Components

No.	Item	Description
1	Power connector (with integral fuse in AC version only)	Connector for the Kilomux-2104 input power
2	Label	Indicates the nominal operating voltage of the Kilomux-2104, and the fuse rating
3	POWER switch	Turns the power on/off
4	RST push-button	Pressing the RST push-button causes the reinitialization of all the modules in the Kilomux enclosure
	ALM indicator	Indicates that a fault has been detected in one of the Kilomux modules
	TST indicator	Indicates that a test (or test loop) is being performed on one of the local Kilomux modules, or on the main link modem. When downloading is activated, the TEST indicator lights when a test is activated by the remote Kilomux modules
5	CONTROL connector	9-pin D-type female connector, for connection to an optional ASCII supervision terminal or to a RADView network management station. Connector pin assignment is given in the Alarms appendix
6	MNG connector	9-pin D-type female connector used as a Dial Port (dial-in/dial-out). Connector pin assignment is given in the Alarms appendix
7	External DIP Switch (SW2)	Described in ***Error! Reference source not found.***
8	ALM RLY connector	6-pin RJ-12 connector with dry contacts for relaying alarms from the Kilomux to activate external equipment (such as lamps, buzzers, fans). The Alarm Relay connector can also be used to relay external equipment information to the Kilomux (such as external sensor information, or fan failure). Connector rating: Max current is 500 mA, Max voltage is 50V For pin assignment refer to *Appendix A*.
9	Main Link connector (X.21 in this case)	Connector for built-in main link. Pin assignments and pin functions are same as for the corresponding plug-in main link modules of the KM-2100 – described in each main link *Installation and Operation Manual*.

2.7 Initial Setup and Configuration

When starting a management session for the first time, it is recommended to prepare Kilomux for communication with the supervision terminal as explained below. The preparations include the setting of switch SW2/3 on the KCL.2 module (refer to *KCL.2 Module* on *page 2-14* for more information), and the connection of the terminal to Kilomux (refer to *Interfaces and Connections* on *page 2-16* for more information).

Internal Kilomux Settings

The default settings of all the sections of the switch SW3 on the KCL.2 module are OFF. To ensure successful establishment of communication with the terminal, you may need to change the settings of the PSWRD section, switch SW3 in section 3. In general, you must enter a password when you start a management session. If the password is incorrect, Kilomux will not respond. The PSWRD section is used to restore the default Kilomux password (RAD).

With this section in the OFF position, you can define your own communication parameters, password. To change to the default values, set the sections to ON, and then press the RESET push-button of the KCL.2 module (if not, the change will take effect the next time Kilomux is turned on). The default values are then loaded and stored.

After performing this procedure, return the switch sections to OFF.

Supervision Terminal

Configure the terminal for the communication parameters you selected for the Kilomux SP port (default values are listed above), select the full-duplex mode, and turn terminal echo off.

Connections

Refer to *Interfaces and Connections* on *page 2-16*.
After making the required connections, turn the supervision terminal on. When applicable, also turn on the modems and any other communication equipment used to connect the terminal to Kilomux.

Initial Configuration

The prompt `PASSWORD>` indicates that password protection is enabled, and you must enter the current password to proceed. However, if you set the PSWRD section of the DIP switch to ON, a null password and node address is used, therefore after pressing ENTER you will obtain the working prompt.

Press ENTER several times to see the working prompt of Kilomux, which is by default **>**.

After the Kilomux prompt is displayed on the terminal, define the terminal control sequences using the command `F` or using the command `init F[]`. Refer to the *Command Set Description* appendix for more information. Typical terminal control sequences are given in the following table.

Table 2-8. Typical Terminal Control Sequences

Function	Terminal Type				
	TV920	**VT52**	**VT100**	**Freedom 100/110**	**Freedom 220**
Clear Screen	1B2A0000	N/A	1B5B324A	1B2A0000	1B5B324A
Cursor Home	1E000000	1B480000	1B5B4800	1E000000	1B5B4800
Cursor Right	0C000000	1B430000	1B5B3143	0C000000	1B5B3143

If the Kilomux system is not yet configured, use the command `DEF SYS` to define at least one PS module and one KCL.2 module. Refer to the *Command Set Description* appendix for more information.

Supervisory Port Configuration

After completing the procedure given above, the supervisory port of Kilomux uses the default values. If necessary, change the configuration of the SP (supervisory) port of Kilomux by entering the command `DEF SP.` Refer to the *Command Set Description* appendix for more information.

You will see the supervisory port configuration data form. A typical form with the default values is shown below:

```
SPEED      DATA     PARITY      INTERFACE      CTS      DCD_DEL     DSR
9.6        8        NONE        DCE            ON       10          ON

POP_ALM    PWD      LOG_OFF     AUXILLARY_DEVICE
NO         NO       NO          NMS-SLIP
```

After selecting the required parameters, you may have to change the configuration of the supervision terminal, to match the new values.

Set the IP address using the `DEF AGENT` command. Refer to the *Command Set Description* appendix for more information. Then reset by pressing “power on” or by using the `RESET LOC` command.

Chapter 3
Configuring Kilomux

3.1 Introduction

In this chapter you will find detailed instructions for configuring Kilomux. The information in this chapter includes:

- General description of Kilomux control and menu organization
- Setting the configuration parameters for Kilomux.

Refer to the *Operation* chapter for a description of the Kilomux front panel, and the syntax, usage and commands of the Kilomux supervision language.

3.2 Control of Kilomux Operation

General

Kilomux operating mode is determined by a set of parameters stored in the internal non-volatile memory of the KCL.2 module. These parameters are selected by the user using a supervision terminal or the RADview network management station. When main link bandwidth is allocated to the Kilomux management channel, the parameters that must be used by both Kilomux units connected by the main link can also be downloaded from one of the units to the other unit.

After the operating parameters have been selected, a process called configuration set-up, the Kilomux no longer requires operator attendance.

The configuration stored in the Kilomux memory is not affected when the power is turned off. Upon power-up, the stored configuration is retrieved and its validity is checked during the power-up self-test:

- If everything is OK, after power-up the Kilomux assumes the last selected configuration and is immediately ready for operation (unless the user wants to change the system configuration).
- If errors are detected in the configuration data, the Kilomux lets you load a default configuration in its place. The default configuration, prepared by the manufacturer, is stored in the program EPROM. The user can later modify the default values as required.

3.3 Setting Configuration Parameters

Before starting any configuration action:

- Obtain a list of the required parameters from your system administrator.
- Review the relevant configuration parameters given in the Configuration Parameters appendix.

During the configuration set-up procedure, Kilomux presents only those parameters available for the modules installed in the enclosure in the currently selected mode. Therefore you must perform the configuration according to this order:

1. Select the system parameters.
2. Select the main link parameters.
3. Set the channel parameters.

In addition, when a supervision terminal is used to control the Kilomux, the communication parameters of the supervisory port must also be defined.

Note *For control of Kilomux test options, refer to the Diagnostics chapter.*

General Configuration Procedure

The following steps are used to perform any configuration activity. The general procedure given below is followed by special considerations for each group of parameters.

Note

Before starting the configuration procedure, always disconnect all the user-initiated loopbacks (select OFF on TEST OPTIONS).

Refer to the Alarms appendix for an explanation of the configuration error messages the Kilomux displays when you make an error.

Configuring the System Parameters

For a list of the system parameters, refer to *Appendix E, Configuration Parameters*. Remember that even if downloading is enabled, you must locally configure the CLK_MASTER and CLK_FBACK parameters on both the local and the remote Kilomux units if the installed main link interface module is KML.1, KML.2, KML.3 or KML.4 (these parameters are not available for KML.5).

- **CLK_MASTER** - Select the appropriate source: INT or an external timing reference source, connected to one of the channels of a KLS.1, KHS.1, KVF.4/S0, KHS.U/S, KHS.U/D, KVF.5/E1/M, or KVF.5/T1/M module. In this case, you must select the CLOCK MODE of this channel as DTE2 (otherwise, you will see CONFIG ERROR 01).

- **CLK_FBACK** - Select NONE or a source different from that selected as master. If you select as external source a channel that is not configured for operation in the DTE2 mode, you will see CONFIG ERROR 02.
- To disable switching to the fallback source, select NONE.
  In this case, the default fallback clock source is the Kilomux internal clock oscillator.
- **DWLD_BW_A, DWLD_BW_B** - Select the desired mode: NO to disable the management channel, or enable the management channel by selecting a specific value in the range of 0.8 through 19.2 kbps and an EXT to indicate if the ML-7 or ML-8 is a dedicated time slot or time slot 0.
- These parameters must be set in order to allow in-band configuration of a remote Kilomux. For more information about in-band communication, refer to the *Remote Management* section in the *General Information* chapter.

Note

When selecting a speed for the download parameter, consider the Kilomux link's total bandwidth. Since the bandwidth is shared, make sure that the speed chosen for the download parameter is high enough to allow the link to work efficiently, but enough bandwidth is left for data transfer.

- **ML_MODE** - When the Kilomux-2100 includes two KML modules, you must define how to use the modules:
  - SINGLE - Single main link operation.
  - REDUND - The two KML modules operate as a redundant pair.
  - DUAL LNK - The two KML modules provide two independent links.
  - PRI BMP - The two KML modules provide two parallel links with priority bumping.
  - SW BACK - One of the KML modules serves as the main link and the other module serves as a switched backup link.
  - SWITCH - Single main link over an ISDN line.
  - DUAL SWITCH - Two main links over an ISDN line.
  - SINGLE and SWITCH - One main link operation and one main link over an ISDN line.
- **ACTIVE_ML** - When redundancy is enabled, you must specify the active KML module:
  - AUTO - Automatic selection of active module, in accordance with the redundancy switch-over criteria. The module is selected as default after power-up is KML-A.
  - ML-A - Module KML-A is selected as the active module. Redundancy is disabled.
  - ML-B - Module KML-B is selected as the active module. Redundancy is disabled.

Note

You can use the ML-A and ML-B selections to enforce the selection of a certain active module, and then enable again the redundancy function by selecting AUTO.

Configuring the Main Link Parameters

For a list of the main link parameters, refer to the *Configuration Parameters* appendix. Remember that even if downloading is enabled, you must locally configure the main link SPEED and TIMING on both the local and remote Kilomux units.

- **SPEED** - Select the main link data rate specified for your Kilomux: 9.6, 14.4, 19.2, 28.8, 32, 48, 56, 64, 128, 192, 256, 384, 512, 768, 1024, or 1536 kbps.

Note

If you are reducing the main link data rate, the following error conditions may occur while the main link rate is reconfigured:

The total data rate of the currently-active channels may exceed the new rate. This will result in CONFIG ERROR 07 (bandwidth overflow).

With a main link data rate of 256 kbps, it is not possible to select a KHS.1 channel rate of 192 kbps. This will result in CONFIG ERROR 9.

With a main link data rate higher than 384 kbps, it is not possible to configure a KVC.1 module (this module is not supported at this main link rate). This will result in CONFIG ERROR 9.

To correct the problem, change the channel parameters as required.

- **TIMING** - Select the timing mode specified for your Kilomux:
  - When the installed module is KML.1, KML.2, KML.3 or KML.4, the available selections are DTE, DCE or E-DCE. With DCE and E-DCE, a reference timing source must be selected as explained for the system parameters.
  - When the installed module is KML.5 or KML.6, the available selections are INT and LBT.
  - When the installed module is KML.7, KML.8 or KML.F, the available selections are DCE, INT and LBT.
  - When the installed module is KML.11, the available selections are Internal, adaptive and DCE (IO).
- When the timing reference is the internal oscillator (irrespective of the installed main link module), it is not recommended to select clock mode DTE2 for data channels.
- **BUFFER_SIZE** - If the selected interface type is DTE or E-DCE, select the appropriate buffer size, in accordance with the communication link media: ±256 bits for satellite links and ±8 bits for any other medium.
- **DSR&CTS** - If the installed interface module is KML.1, KML.2, or KML.3, select the desired method of handling the DSR and CTS lines: INT if you want these lines to be ignored, or EXT if you want the transmit data to be held at MARK when either of these lines is OFF.

Configuring the Channel Parameters

The configuration parameters available for each Kilomux user module and for their channels and for specific configuration instructions, refer to the corresponding module *Installation and Operation Manual* contained in Part II of this manual.

Configuring the SP Parameters

For a list of the SP parameters, refer to Appendix E, Configuration Parameters. You must always configure the supervisory port parameters locally, irrespective of the use of downloading.

- **SPEED** - Select AUTO whenever feasible. In this case, start the communication by pressing <ENTER> three times, to ensure positive identification of terminal data rate.

Note

The automatic baud rate recognition procedure should be repeated after the DTR line in the SP connector had been switched to OFF and then ON again.

- **DATA** - Select the required number of data bits (same as on the terminal).
- **PARITY** - Select the required parity (same as on the terminal).
  - Select DCE when directly connected to the supervision terminal. In this case, you need a straight cable.
  - Select DTE when connected to a modem. In this case, use a cross-over cable for connection to the modem.
- **MANAGEMENT** - Select YES when the Kilomux will be managed by a RADview network management station. Select NO in any other case.

Chapter 4
Operation

4.1 General

This chapter describes the normal operation of the Kilomux.

The information in this chapter includes:

- Description of the supervision terminal set of commands: syntax, options, protocol and descriptions
- Description of the functions of the Kilomux controls, connectors and indicators, located on the Kilomux front panel
- General operating instructions, including turn-on, routine operations, and turn-off.

For an explanation of the error messages that may be displayed on the supervisory terminal, refer to *Appendix B, Alarms*.

The initial configuration of a Kilomux must always be performed by means of a supervision terminal connected to its supervisory port, using the procedures described in the *System Installation and Setup* chapter. However after initial configuration, Kilomux can also be managed by means of a RADview network management station. For RADview management procedures, refer to the *RADview-PC/TDM User's Manual*.

4.2 Kilomux Supervision Language

The following presents the Kilomux supervision language syntax, usage, and commands.

Command Language Syntax

- Commands can be entered only when the Kilomux supervisory port prompt is displayed. The prompt always appears at the beginning of a new line, and the cursor appears to the right of the prompt.
- The prompt identifies the database being edited:
  - When you are working on the currently active database, the prompt is
    `KM2100>` for Kilomux-2100
    `KM2104>` for Kilomux-2104
  - When you are working on the alternate database, the prompt is `ALT_DB>`

- Commands are case-insensitive, e.g., you can type commands in either lower case and/or upper case letters.
- To correct typing errors, press the BACKSPACE key until the error is cleared, and then retype the correct command.
- Use a space as a separator between command fields and/or parameters.
- Commands must end by pressing ENTER.
- To use a command with the existing parameters, type the command name and press ENTER.
- To cancel the current command, press the BREAK key, or CTRL-C (that is, hold the CTRL key down and type C). You will obtain the Kilomux prompt again.
- To repeat the previous command, press CTRL-A.
- To repeat the previous command followed by pressing ENTER, press CTRL-D.

Command Options

The following general types of options shown in *Table 4-1* are available with some commands. For details refer to the relevant appendix.

Table 4-1. General Command Options

Option	Meaning	Example of Usage
/A	All	CLR ALM /A Clears all the alarms stored by the alarm buffer
/C	Clear	DSP ALM /C Display all the alarms stored by the alarm buffer and then clear all the event alarms
/CA	Clear all	DSP ALM /CA Display all the alarms stored by the alarm buffer and then clear all the alarms
*	Display all the relevant information for the requested item	DSP REV * Displays the hardware and software revisions of all the modules installed in Kilomux

Command Protocol

Starting a Session

- If AUTOBAUD is on, start any session by pressing the ENTER key three times in sequence. This will ensure identification of terminal data rate.
- When password protection is on, the displayed prompt is `PASSWORD>` and the addressed Kilomux waits for the password before continuing. After the correct password is received, Kilomux sends the following working prompt:
  `KM2100>` for Kilomux-2100
  `KM2104>` for Kilomux-2104.
  If password protection is off, this step is omitted and the working prompt appears after the node address conditions are fulfilled.
- The first action to be carried out when starting a session is to check and, if necessary, set the correct terminal control codes, using the `F` command.

The terminal control codes, determined by the `F` command, are used to clear the screen, move the cursor to the screen home position, and move the cursor to the right by one position. Using the terminal control codes suitable for the type of terminal connected to Kilomux is essential to proper display of the information sent by Kilomux on the terminal screen: certain combinations of codes can lead to unclear displays.

If the information on your screen is unclear, issue the `INIT F []` command. If there are no parameters, use the `F` command to set the desired control codes.

Command Evaluation and Execution

- After the working prompt is displayed, every character typed on the terminal keyboard is immediately evaluated by Kilomux and echoed to the terminal screen. Full duplex communication with the terminal is therefore necessary, to provide on-line feedback to the terminal operator.
- Command evaluation starts only when the ENTER key is pressed.
- Certain commands, mainly DSP commands, are not accepted for the alternate database.
- In case an error is detected during command evaluation, the command is not executed. Instead, Kilomux will send the erroneous command back to the terminal, and you will see:

  ```
  BAD COMMAND OR PARAMETER. TYPE 'H' FOR HELP
  ```

- The correct command must then be resent.
- The command is executed only after it is validated.
- Command execution can be interrupted by pressing BREAK or CTRL-C. This will result in the display of the Kilomux prompt, and a new command can be entered.

- After the command is executed, a time stamp is displayed in the following format:

```
time: HH:MM:SS    date: DAY MMM,DD,YYYY
```

- where
  `MMM` is written as JAN, FEB, etc.
  `DAY` is written as SUN, MON, etc.
- The supervisory port prompt (`KM2100>`) is displayed on the line following the time stamp.

Command Fields

- When a command has several fields, use the space bar to move the cursor among the various fields. However, for some commands, the ENTER key is used instead. This is indicated in the command description.
- When a field has a limited range of values, the available values can be displayed by scrolling. Scrolling is performed by bringing the cursor to the desired field, and then pressing the F (forward) or B (backward) key until the desired value is displayed.
- If a certain field is not applicable to the current command, the field shows `N/A` and scrolling is not possible. `N/A` will appear in fields of a DEF command that specify parameters not used in the selected operating mode.

Ending a Session

- If an idle disconnect time-out is specified, Kilomux will automatically disconnect the ongoing session if no command is received from the terminal for the specified time-out interval.
- The EXIT command disconnects the supervisory port and transfers the control to the front-panel LCD and push-button.
  After ending a session by the EXIT command, you can press any alphanumeric or editing key to start a new session. It is recommended to press the ENTER key.

Index of Commands

Table 4-2 lists the Kilomux commands in alphabetical order. Note that some commands have both a long hand and an abbreviated format.

Table 4-2. Kilomux Command Set Index

Command	Purpose	Options
BYE	Return control to the Kilomux front panel at the end of a TELNET session.	
CLR ALM	Clear alarms stored in the Kilomux alarm buffer	/A
CLR LOOP CLR LP	Clear user-initiated loops or tests	
CLR LAN STATISTICS CLR LAN STAT	Clear Tx and Rx frame counter	

Table 4-2. Kilomux Command Set Index (Cont.)

Command	Purpose	Options
CLR MONITOR CLR M	Deactivate I/O module channel monitor	
CONNECT SWITCH	Connect ISDN line between a local and remote Kilomux	A B
DATE	Set the date for the Kilomux internal clock	
DEF AGENDA	Define a daily schedule for operation in the switched backup mode	
DEF AGENT	Define the IP parameters to the local Kilomux	
DEF ALM DEBOUNCE	Define the debounce time in seconds for each alarm code or mask the alarm	
DEF CALL	Define the dial-out parameters for the dial-out port	
DEF CH	Configure the parameters of a selected module channel (voice or data)	
DEF CON	Define the main link and priorities of each module	
DEF DB FLIP	Define the times of day for the switching (flipping) between the two databases	
DEF DP	Define the parameters of the dial-out port	
DEF FRAME	Define manually the allocation of main link bits	
DEF MANAGER LIST	Define or modify the network management stations to which the SNMP agent sends traps	
DEF ML	Define parameters for the main link	
DEF ML CALL	Define the switched backup connection setup parameters (for use in the switched backup mode)	
DEF NAME	Define the logical name of Kilomux	
DEF NODE	Define the node number of Kilomux	
DEF NP	Define the configuration parameters of the network port	
DEF PWD	Define new password, and/or display the current password	
DEF ROUTE	Enables static routing via the ETHERNET management port	
DEF SP	Configure supervisory port parameters	
DEF SYS	Configure system parameters	
DISCONNECT SWITCH	Disconnect the ISDN line between the local and remote Kilomux	A B
DSP AGENT	Display the IP and SNMP agent parameters	
DSP ALM	Display the contents of the alarm buffer and optionally clear the buffer	/C /CA
DSP BERT	Display the result of the BERT test running on an I/O module channel	/C
DSP CH CON	Display information on connected channels	
DSP HDR TST	Display hardware faults (detected during the power-on self-test, and during normal operation)	

Table 4-2. Kilomux Command Set Index (Cont.)

Command	Purpose	Options
DSP FLIP	Display cause of last main link flip	
DSP MANAGER LIST	Display the network management station to which the SNMP agent sends traps	
DSP KVF5 or PBX	Display the configuration parameters of a group of KVF.5 modules	
DSP KVF6	Display the configuration parameters of the KVF.6 modules in the Kilomux	
DSP PRBS_INJ	Display the result of the PRBS test running on an I/O module channel	/C
DSP REM AGENT	Display the other Kilomux connected to the local Kilomux	
DSP REV	Display the hardware and software revisions of the modules	*, I
DSP SIG or SIGNALING	Display the signaling bits state in KVF.5 or KVF.6 modules	
DST ST FRAME DSP ST FR	Display information on current frame usage (current bit allocation), as defined in the active database	
DSP ST ML	Display active main link status information	
DSP ST SLOT	Display I/O module status information	
DSP ST SYS	Display system status	
EDIT DB	Select the alternate (not active) database for editing	
EXIT	End the current control session	
F	Select the codes for “clear the screen”, “cursor home”, and “cursor right”	
FLIP ML	Change active KML module in a redundant system	
H	Display a concise index of commands and option switches	1 2 3 4
INIT DB	Load the default configuration instead of the user configuration. *Table F-6* lists the default parameter values	
INIT F	Set all the codes for “clear the screen”, “cursor home” and “cursor right” to 0 TV920 VT52 VT100 Freedom 100/110 Freedom 220	
LOAD DB 1\2	Loads the Kilomux database to a file to enable transfer to a remote Kilomux via FTP	
LOAD IO	Software download to KVF.6 or KVF.8 modules, through a DL connection in the modules front panel	

Table 4-2. Kilomux Command Set Index (Cont.)

Command	Purpose	Options
LOOP or LP	Activate a specified loopback or test	
ML RECOVERY	Recover from a priority bumping event	
MONITOR	Operate the monitor on the selected I/O module channel	
REBUILD FRAME	Rebuild the Kilomux frame	A B
RESET LOC	Reset the local Kilomux	
RESET IO	Reset the I/O module	
RESET ML	Reset the main link module	
TIME	Set the time of the Kilomux internal clock	
UPDATE DB 1\2	Updates the Kilomux database from a file with a database package that was received from a remote Kilomux via FTP	

4.3 Front Panel Indicators

Table 4-3 lists the functions of the indicators located on the Kilomux front panel. The index numbers in *Table 4-5* correspond to the item numbers in *Figure 4-1* and *Figure 4-2*.

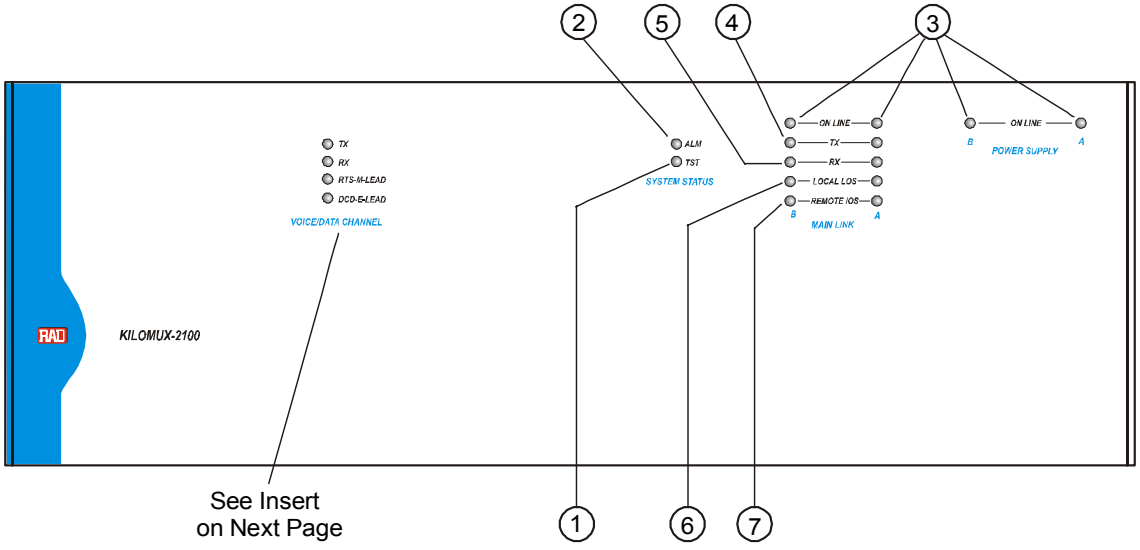


Figure 4-1. Kilomux-2100 Front Panel

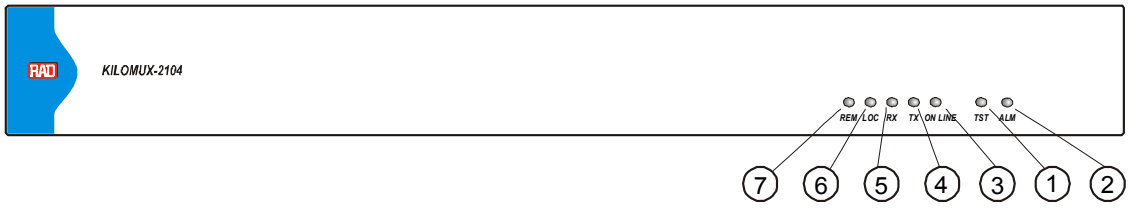


Figure 4-2. Kilomux-2104 Front Panel

Table 4-3. Kilomux Controls, Connectors, and Indicators

No	Control or Indicator	Function
1	TEST indicator	Indicates that a test (or test loop) is being performed on one of the local Kilomux modules (for main link modules KML.1 through KML.4, this indicator will also light when a V.54 loop is activated on the modem serving the main link). When downloading is activated, also lights when a test is activated by the remote Kilomux on one of the local Kilomux modules
2	ALARM indicator	Indicates that a fault has been detected in one of the Kilomux modules
3	ON LINE indicator	Lights steadily when the module is operating properly and is active. For KML modules, flashes when the module is operating properly, but is in standby (the other module of the same type is active). Off when the corresponding module is defective, or is not installed. ON-LINE indicators are located on the KML and KPS modules
4	TXD indicator	Indicates activity on the transmit line of the active KML module. The indicator is located on the KML module
5	RXD indicator	Indicates activity on the receive line of the active KML module. The indicator is located on the KML module
6	LOCAL SYNC LOSS indicator	Lights when the local Kilomux has lost frame synchronization. The indicator is located on the KML module
7	REMOTE SYNC LOSS indicator	Lights when a loss-of-frame synchronization indication is received from the remote Kilomux. This indication is available only when downloading is activated. The indicator is located on the KML module

In addition, the front panel includes four indicators that can be connected by means of the TEST OPTIONS-MONITOR menu to any desired channel. The indicator functions are as follows:

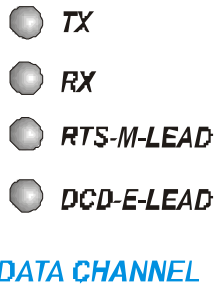


Figure 4-3. Indicator Functions

- **TX** - Indicates activity on the transmit path of the selected channel.
- **RX** - Indicates activity on the receive path of the selected channel.
- **RTS-M-LEAD** - If the selected channel is a data channel, shows the state of the RTS line. If the selected channel is a voice channel, shows the state of the M lead.
- **DCD-E-LEAD** - If the selected channel is a data channel, shows the state of the DCD line. If the selected channel is a voice channel, shows the state of the E lead.

4.4 Operating Instructions

The Kilomux is operated through the supervision terminal

Supervision Terminal

Before using the supervision terminal, make sure the preparations listed in the *Initial Setup and Configuration* section in the *System Installation and Setup* chapter were completed and all the relevant equipment has been turned on.

Power-Up

During the power-up procedure, Kilomux automatically sends information through its supervisory port to allow the monitoring of the power-up self-test from a supervision terminal.

Upon power-up, the supervision terminal displays:

```
<BEL>Kilomux SUPERVISORY PORT ON LINE. TYPE 'H' FOR HELP
```

where <BEL> stands for the graphic symbol of the <BEL> code (ASCII 07).

While the KCL module performs the power-up self-test, the supervision terminal displays:

```
CL Board Self Test In Progress ....
```

After the self-test is completed, the result, `OK` or `FAILED`, is added to the displayed line. Kilomux starts reading the installed modules, and the supervision terminal displays:

```
Reading Installed Modules .....
```

After the reading is completed, the state of the installed modules is displayed in the following format:

```
SLOT 1              PS-A    OK
SLOT 2              PS-B    OK
SLOT 3              ML-A    OK
SLOT 4              ML-B    OK
SLOT 5              CL      OK
I/O SLOT 1          I/O 1   OK
I/O SLOT 2          I/O 2   OK
I/O SLOT 3          I/O 3   OK
I/O SLOT 4          I/O 4   OK
I/O SLOT 5          I/O 5   OK
I/O SLOT 6          I/O 6   OK
I/O SLOT 7          I/O 7   OK
I/O SLOT 8          I/O 8   OK
I/O SLOT 9          I/O 9   OK
I/O SLOT 10         I/O 10  OK
I/O SLOT 11         I/O 11  OK
I/O SLOT 12         I/O 12  OK
```

If you see `FAILED` for any module, replace that module.

Starting a Session - Single Kilomux

When the terminal is used to control a single Kilomux, always assign node address 0 to Kilomux. Use the following start-up sequence to connect to a Kilomux assigned node number 0.

1. If you use the AUTO (Autobaud) mode, press the ENTER key three times.

   This allows Kilomux to identify the terminal data rate.

   Assuming that Kilomux successfully identified the data rate of the supervision terminal, you will be notified if Kilomux failed the power-up self-test:

   - If you see `Kilomux-2100 SELFTEST FAILED`, Kilomux must first be repaired before you can continue using it.
   - If Kilomux successfully passed the power-up self-test, it displays the following:

```
<BEL>Kilomux-2100 SUPERVISORY PORT ON LINE. TYPE 'H' FOR HELP
```

   where <BEL> stands for the graphic symbol of the <BEL> code (ASCII 07).

   After the self-test, the Kilomux prompt should already be displayed on the terminal screen after the ON-LINE announcement. If you see

```
PASSWORD>
```

   this indicates that password protection is enabled.

2. In this case, type:

   `'password'` and press ENTER

   where 'password' stands for the current password (four to eight characters). The default password is `RAD`.
   If your password is accepted, you will see the prompt KM2100>.

   Kilomux is now in session under your control.

On your terminal, you will see the prompt:

```
KM2100>
```

or

```
KM2104>
```

On the Kilomux front panel, you will see the message:

```
TERMINAL ON LINE
```

The front panel controls are disabled as long as Kilomux is under remote control.

3. Before you continue, use the F command to select the proper cursor control codes, otherwise the DEF commands may not work properly.

Note *While the supervision terminal is in session with Kilomux, the Kilomux local operator can regain control by disconnecting the cable from the Kilomux SP connector, or by sending the EXIT command. Kilomux will automatically return to front panel control if no commands are received for a certain time (controlled by the LOG_OFF parameter). This time-out can be disabled*

Starting a Session - Multiple Kilomux

When one terminal is used to control several Kilomux units connected via modems, node addresses are assigned to each Kilomux. The node addresses, in the range of 1 through 255, are assigned during the first session, by means of the command NODE.

Note *If you are using a multidrop configuration, do not assign address 0 to any Kilomux connected to this terminal.*

➤ **To establish a session with a specific Kilomux:**

1. Press the ENTER key three times.
2. Type NODE, space, the desired Kilomux node address and another space, then type the desired command and press ENTER. For example, with node address 234, type:

   `NODE<SP>234<SP> 'command'` and press ENTER

   - If the addressed Kilomux does not use password protection, it will immediately execute the command.
   - If the addressed Kilomux is password protected, you will see the prompt:

     ```
     PASSWORD>
     ```

3. Type the node address again and then type the password. For example, for node address 234, type:

   `NODE<SP>234<SP>'password'` and press ENTER

   If the password is correct, Kilomux will execute the command. Otherwise, you will see:

   ```
   PASSWORD>
   ```

Control Session

1. During the control session, type the desired commands at the terminal keyboard. You must see the Kilomux echo character by character.
2. When you see the correct and complete command in the echo line, press ENTER to execute the command.

   Kilomux will process the command and display the appropriate response. At the end of the command execution, Kilomux displays the current time and date, and then provides a new prompt on the next line.

3. If you changed your mind and want to abort the command, press BREAK or CTRL-C.

   You will receive the prompt again, so you can enter another command.

   If your command is not correct, Kilomux will not execute it, but will echo the command and display

   ```
   BAD COMMAND OR PARAMETER. TYPE 'H' FOR HELP
   ```

4. Type the correct command.

Ending a Control Session

➤ **To end the control session:**

- Type:

```
EXIT
```

The Kilomux prompt will disappear. Now you can control Kilomux from its front panel.

Note

A control session may also be terminated by Kilomux if the idle disconnect time-out is enabled, or when the DTR line switches to the inactive (OFF) state.

The following sections describe how to turn Kilomux on and off, the normal indications and what to do in case of a malfunction.

Turn On

If the Kilomux-2100 includes a KM-Ringer module, first set the KM-Ringer module power switch to OFF, and then turn the Kilomux on by setting the ON/OFF switches (located on the rear panels) to ON.

Upon turn on, Kilomux decompresses software in flash (30 seconds) and then Kilomux performs self-test. This is indicated by the lighting of the TEST indicator. Observe the front panel indications.

Note

If the Kilomux fails the power-up self-test the Kilomux must be repaired before it can be used again. Refer to the Diagnostics chapter for troubleshooting instructions.

If the configuration data stored by the Kilomux is corrupted, a DB1 CHKSUM ERR alarm message is generated. In this case, you must load the default configuration as explained in the Configuring Kilomux chapter.

If the Kilomux-2100 includes a KM-Ringer module, you may now turn it on by setting its POWER switch to ON. The RING VOLTAGE and BATTERY VOLTAGE indicators must light.

You can verify the Kilomux configuration as explained in the *Configuring Kilomux* chapter. If the configuration does not require modification, the Kilomux is ready for operation immediately after self-test is completed. To change the configuration, refer to *Chapter 3, Configuring Kilomux*.

Normal Indications

- **KPS Module(s):** The lamp in the power switch of the KPS module(s) lights to indicate proper operation.
- **KML Module(s):** The ON-LINE indicator of the active module must light. The TXD and RXD indicators will light in accordance with the activity on the corresponding line.
- **KCL Module:** After the initial power-up self-test, the TEST indicator turns off. It may turn on again after a test is initiated.
- **KM-Ringer Module:** The RING VOLTAGE and BATTERY VOLTAGE indicators must light, to indicate proper operation.
- **KAI Module**: The KAI module, when installed, reproduces the indications displayed on the Kilomux-2100 front panel.

If the other communication equipment on the link is not yet operative, the ALARM indicator, and/or LOCAL SYNC LOSS, and/or REMOTE SYNC LOSS indicator may light. These indicators must turn off as soon as the link with the remote unit is established.

If the ALARM indicator continues to light, this indicates the presence of alarms in the alarm buffer. After the alarms are cleared, the ALARM indicator should turn off.

What to do in Case of Malfunction

In case a malfunction occurs, perform the following preliminary checks and actions:

- Check that the modules are properly installed and inserted in the slots specified by the installation plan.
- Check that all the cable connections were made in accordance with the installation plan.
- If upon turn-on the Kilomux displays a DB CHKSUM ERR message, refer to *Chapter 2, Installation* and do the following:

  1. Turn the Kilomux off.
  2. Remove the KCL module, set section 2 of switch SW3 to ON, and reinstall the KCL module.
  3. Turn the Kilomux on, wait until the self-test is successfully completed, then turn the unit off.
  4. Remove the KCL module, set section 2 of switch SW3 to OFF, and reinstall the KCL module.
- The default data base configuration has now been loaded. You may now start the configuration activities based on the known set of default parameter values.

- Check the settings of switch SW3 on the KCL module:
  - Section 1 - Master/Slave: OFF
  - Section 2 – DB INIT: OFF
  - Section 3 – PSWRD: OFF
  - Section 4 – DEBUG: OFF
- Check that all the communication equipment serving the main links operates properly.
- Check all the configuration parameters against the prescribed set of parameters.
- Press the RESET push-button of the KCL module.

If these actions do not correct the problem, refer to *Chapter 5, Diagnostics* to identify the fault and replace the corresponding module.

Turn Off

➤ **To stop equipment operation, use the following procedure:**

1. If the Kilomux-2100 includes a KM-Ringer module, first turn the KM-Ringer off before the Kilomux-2100.
2. Turn the Kilomux off by setting the ON/OFF switches of the KPS modules installed in the enclosure to OFF.

Chapter 5
Diagnostics

5.1 Alarms

The Kilomux generates two types of alarms, designated as state and event.

- A message indicating a ***state*** alarm is displayed only when the alarm condition is present, and is automatically removed when the condition is cleared (if the alarm is being displayed, it will disappear only when the display is refreshed by scrolling).
- A message indicating an ***event*** alarm persists even after the event that caused the alarm condition is cleared.

The alarm messages are sent to the supervision terminal or management station. Using the `DEF ALM DEBOUNCE` command, the Kilomux operator can define the debounce time (in seconds) for each alarm code or mask the alarm. Refer to the *Alarms* appendix for more information, and for a list of the alarm messages displayed by the Kilomux.

If the problem cannot be corrected by carrying out the listed actions, have the Kilomux checked by the technical support personnel.

5.2 Diagnostic Tests

This section describes:

- The TEST OPTIONS operating instructions
- The Kilomux diagnostic functions.

Kilomux TEST OPTIONS, General

The diagnostic functions accessed by means of TEST OPTIONS include three groups:

- **LED** - Monitoring of a selected user channel by means of the front panel indicators.
- **ML** - Control and indication of main link loops:
  - Local main link loop
  - Remote main link loop
  - Local ITU-T Rec. V.54 loop
    (ITU-T Rec. V.54 loop 2)

  - Remote ITU-T Rec. V.54 loop
    (ITU-T Rec. V.54 loop 3).

- **i:j** - Control and indication of channel loops and tests (i indicates the module slot number, and j indicates the module channel number):
  - Local channel loop
  - Remote channel loop
  - Tone injection (for voice channels only)
  - PRBS (pseudo-random sequence) transmission, for data channels only
  - BERT (bit error rate test), for data channels only. Can be performed only if downloading is enabled.

In addition, you can see the test state at the remote Kilomux. This function is available only when downloading is enabled.

Special Considerations

When using the Kilomux diagnostic functions, pay attention to the following points:

- When you select a channel for monitoring, the monitoring of any previously selected channel is automatically interrupted.
- Generally, at any time, only one loop of a given type can be activated on the main link, and on each of the user channels. However, the signal paths formed when certain loops or tests are active inherently disconnect the signal paths required by other loops.

  As a typical example, consider the case of a main link remote loop: if such a loop is activated on the local Kilomux in response to a command sent through the management channel by the remote Kilomux, then the operator of the local Kilomux can no longer activate a local main link ITU-T Rec. V.54 loop.
- On the local Kilomux, the following combinations of loops are not possible:
  - Simultaneous activation of local and remote main link loops
    (CONFIG ERROR 3)
  - Simultaneous activation of main link ITU-T Rec. V.54 loop 2 and loop 3
    (CONFIG ERROR 3)
  - Simultaneous activation of local and remote loops on the same channel
    (CONFIG ERROR 4)
  - Simultaneous activation of local loop and PRBS transmission on the same data channel (CONFIG ERROR 4)
  - Simultaneous activation of local loop and BERT test on the same channel
    (CONFIG ERROR 4)
  - Simultaneous activation of local loop and tone injection on the same voice channel (CONFIG ERROR 4).

Test Options Operating Instructions

The following provide detailed instructions for:

- Activating/deactivating PRBS transmission on a data channel
- Activating/deactivating BERT testing on a data channel
- Activating/deactivating tone injection on a voice channel
- Displaying the state of channel ITU-T Rec. V.54 loops (for KLS.1 – also activation/deactivation)
- Displaying the state of loops initiated at the remote Kilomux unit.

Activating / Deactivating PRBS Transmission on a Data Channel

After the pseudo-random sequence (PRBS) transmission test is activated on the selected data channel, as explained in the previous section, the next time you select TEST OPTIONS for this channel, the second display row shows the current test results:

- PRBS [GOOD]: ON – PRBS transmission is being performed on this channel, and no error has been detected on the data channel.
- PRBS [BAD]: ON – PRBS transmission is being performed on this channel and at least one error has been detected. This indication is normal if no loopback is connected.

Activating / Deactivating BERT Test on a Data Channel

Same as PRBS test, except that when the BERT test is initiated, a remote channel loop command is automatically sent to the remote Kilomux. In this case, a BERT [BAD]:ON display always means that errors have been detected.

Activating / Deactivating Tone Injection on a Voice Channel

After tone injection is activated on a voice channel, the remote subscriber connected to this channel should hear the test tone (an 1 kHz tone) clearly and loudly. If downloading is enabled, you can also activate a remote loop: in this case, the test tone is also heard by the local subscriber.

Kilomux Diagnostic Functions, General

The Kilomux diagnostic functions can be used to test the proper operation of the Kilomux system and identify efficiently the faulty components. The available functions are:

- Connection of a local or remote test loop on the main link
- Connection of a local or remote test loop on the modem serving the main link, provided the modem supports the ITU-T Rec. V.54 control pins
- Connection of a local or remote test loop on the desired I/O module channel
- Pseudo-random sequence (PRBS) transmission on a selected channel of a data I/O module
- Bit error rate test (BERT) on a selected channel of a data I/O module, using a pseudo-random sequence

- Injection of 1 kHz, 0 dBm0 (digital milliwatt) audio signal for testing the transmit path of the desired voice I/O module channel.

Note that no tests are available for the KCL.2 module, because this module controls the management interface, i.e., the front-panel controls and the interfacing with a supervision terminal or RADview network management station, and the Kilomux operation. Therefore, the KCL.2 module is inherently "tested" when a proper response is obtained to any operator request, and the Kilomux operates normally.

If it is necessary to replace the KCL.2 module, you can preserve the existing database in two ways:

- The fastest way is to remove the NVRAM component from the replaced module and installing it on the replacement module.
- If the above way is not possible, the replacement module can be preconfigured in another Kilomux and then installed in the desired unit. This allows the replacement of a defective KCL.2 module without disrupting the operation of the Kilomux, because the Kilomux can continue to operate even if the KCL.2 module is temporarily removed.

Caution If you insert a new KCL.2 module in an operating Kilomux-2100 without first either transferring the NVRAM (or preconfiguring the module), then when the KCL.2 module is inserted in the Kilomux-2100 the system is reset to the default values.

Test control is executed from the TEST OPTIONS menu. In this chapter you will find information on the tests (loops) available on the main link interface modules and the main link modems.

You will also find a general description of the test functions applicable to I/O modules. ***Specific information on the tests available for each I/O module is provided in the corresponding module Installation and Operation manual.***

Note *In this chapter, local means the Kilomux unit at which the test command has been given, i.e., it is always assumed the command has been given using the front panel controls of, or a supervision terminal connected to, the local Kilomux.*

Caution Do not set up a local loop in a remote Kilomux with in-band management. Doing so could cause the main link connection to be lost.

Main Link Loops

The Kilomux supports two types of main link loops:

- Test loops activated on the KML modules. These loops provide information on the functioning of the KML modules. However, since the loops are performed at the interface between the Kilomux unit and the other system elements, these loops also provide information on the functioning of the complete unit.

- Test loops activated on the modem serving the main link, provided the modem supports ITU-T Rec. V.54 loops. These loops provide information on the transmission equipment that provides the connection between the two Kilomux units.

The following explains the main link loops, describes the front-panel indications that are relevant to the interpretation of the test results, and in addition provide a recommended testing sequence that allows the identification of the general location of a fault.

Local Main Link Loop

Always perform a local main link loop on each of the two Kilomux units.

Local Main Link Loop - Signal Path

When a local loop is activated on a KML module, the main link transmit signal is returned to the input of the main link receive path at a point just before the line interface. In order to provide a keep-alive signal to the transmission equipment serving the link while the loop is activated, the line interface also transmits the signal to the line. The loop signal path is shown in *Figure 5-1*.

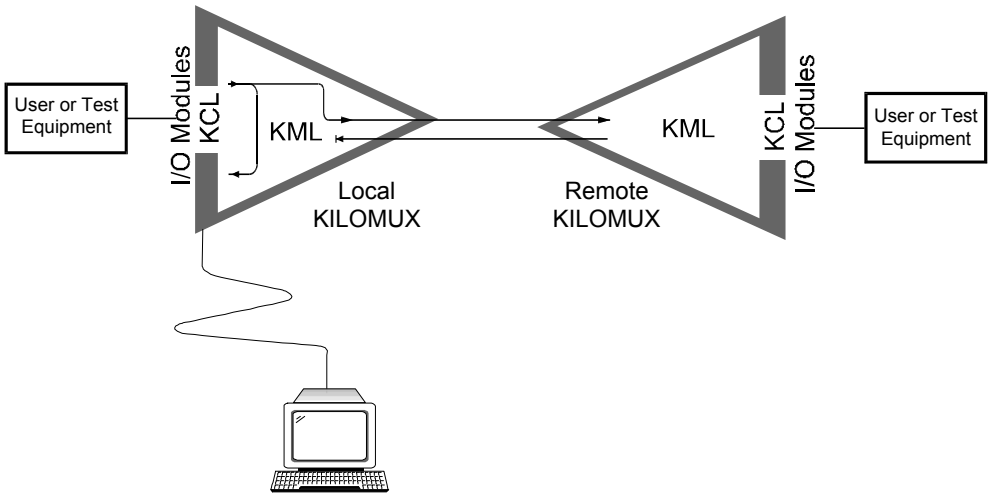


Figure 5-1. Local Main Link Loop, Signal Path

Local Main Link Loop – Normal Indications and Fault Isolation

- The TEST indicator of the local Kilomux lights.
- The TXD and RXD indicators of the local Kilomux must light. If not, the local Kilomux is defective.
- The SYNC LOSS indicator of the local Kilomux must be off. If it lights, the local Kilomux is defective.

Caution

Do not set up a local loop in a remote Kilomux with in-band management. Doing so could cause the main link connection to be lost.

Remote Main Link Loop

As a rule, connect the remote main link loop only if both Kilomuxes pass the local main link loop test successfully.

Remote Main Link Loop – Signal Path

The remote loop is connected on the local Kilomux unit, i.e., the local KML module returns the received signal toward the remote Kilomux. The loop signal path is shown in *Figure 5-2*.

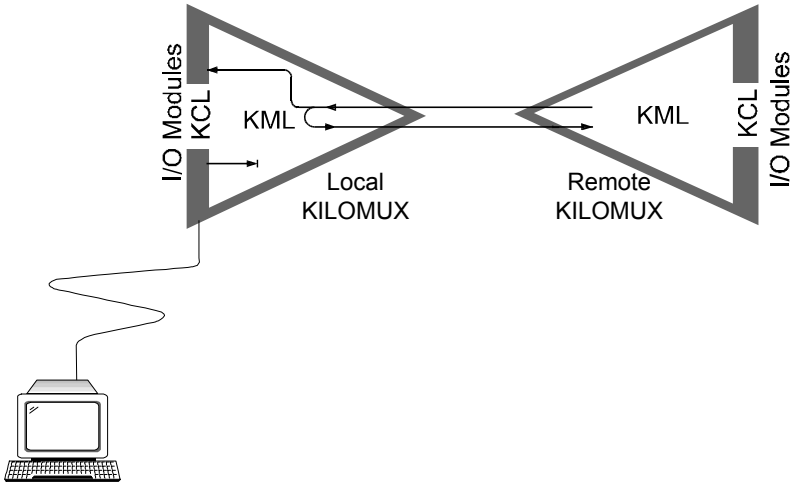


Figure 5-2. Remote Main Link Loop, Signal Paths

Remote Main Link Loop – Normal Indications and Fault Isolation

- The TEST indicator of the local Kilomux lights.
- The TXD and RXD indicators of the local and remote Kilomux units must light, and the LOCAL SYNC LOSS indicator of the remote Kilomux unit must be off.

If there is a problem, trace the fault by checking the indications in the order given below:

1. If the TXD indicator of the remote Kilomux unit does not light, the fault occurred in the remote Kilomux unit: check by performing a local main link loop on the remote unit.
2. If the TXD indicator of the remote Kilomux unit lights but the RXD indicator of the local Kilomux unit does not light, probably there is a problem in the transmit path to the local unit. There is however a low probability that the fault occurred in the local or remote Kilomux units: check by performing local main link loops.
3. If the RXD indicator of the local Kilomux unit lights, but its TXD indicator is off, the local Kilomux unit is defective.
4. If the TXD indicator of the local Kilomux unit lights but the remote RXD indicator is off, probably there is a problem in the transmit path to the remote unit. There is however a low probability that the fault occurred in the remote Kilomux unit: check by performing a local main link loop on the remote unit.
5. If the RXD indicator of the remote Kilomux unit lights, but its LOCAL SYNC LOSS indicator lights, a fault is present. The fault is in the remote Kilomux: check by performing a local main link loop.

Local Main Link Modem Loop - Loop 3

The main purpose of the main link modem loop 3 is to check the connections between the KML module and the local modem. Usually, this loop is activated after the remote main link loop fails but both the local and the remote Kilomux units successfully pass the local main link loops. If this loop is successful, the next loop to be performed is the remote main link modem loop, loop 2.

Therefore, as a rule, perform loop 3 only after successfully performing a local main link loop on the local Kilomux unit.

Main Link Loop 3 – Signal Path

When loop 3 is activated on a modem that supports this function, the Kilomux transmit signal is returned by the local modem on the receive path. The loop signal path is shown in *Figure 5-3*.

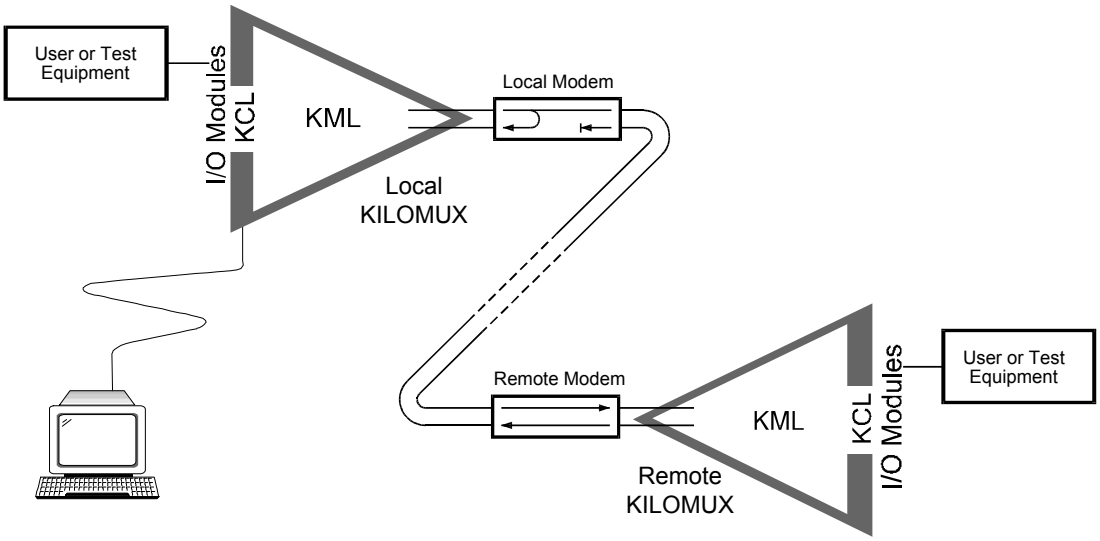


Figure 5-3. Main Link Modem Loop 3, Signal Path

Main Link Loop 3 – Normal Indications and Fault Location

- The TEST indicator of the Kilomux lights.
- The TXD and RXD indicators of the local Kilomux must light, and the LOCAL SYNC LOSS indicator must be off. If not, the connections to the modem, or the modem itself, are defective.

Remote Main Link Modem Loop - Loop 2

The main purpose of the main link modem loop 2 is to check the link between the two modems that serve the main link. As a rule, perform loop 2 only after successfully performing loop 3 on the local Kilomux unit.

Main Link Modem Loop 2 – Signal Path

When loop 2 is activated on a modem that supports this function, the remote modem returns the receive signal toward the local modem, therefore the local Kilomux transmit signal is returned to the receive path.

The loop signal path is shown in *Figure 5-4*.

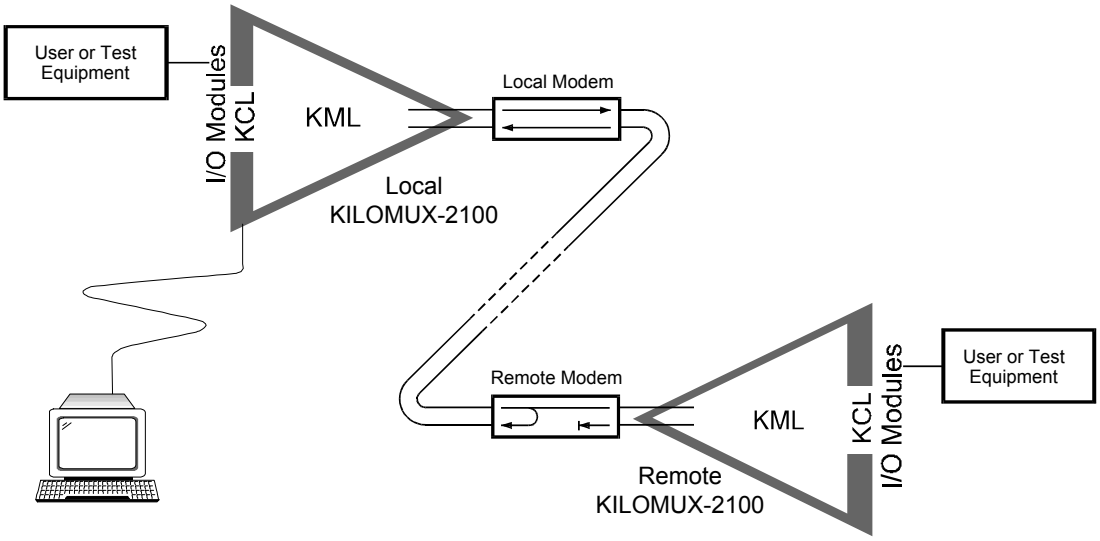


Figure 5-4. Main Link Modem Loop 2, Signal Path

Main Link Modem Loop 2 – Normal Indications and Fault Location

- The TEST indicator of the Kilomux lights.
- The TXD and RXD indicators of the local Kilomux must light, and the LOCAL SYNC LOSS indicator must be off. If not, the connections and/or the link between the two modems, or the modems, are defective.

I/O Module Loops and Tests

The tests available for I/O modules depend on the module type, however in general all the I/O modules support local and remote channel loops, and the monitoring of the transmit and receive activity and of the main control signals by means of the front-panel indicators.

In addition, the Kilomux supports module-specific tests:

- For data I/O modules, the Kilomux provides PRBS transmission and BERT testing on individual channels. PRBS transmission allows supplying a test signal to a data channel, and the BERT test provides a quick qualitative check of transmission performance without requiring external data transmission test equipment.
- For voice I/O modules, the Kilomux provides test tone injection. The test tone can be heard by the subscribers connected to the voice channels, thus providing a quick qualitative check of the voice path.

For specific information on the tests available for each I/O module, refer to the corresponding module Operation and Installation manual.

Local Channel Loop

When a local loop is activated on a channel of an I/O module, the channel transmit signal is returned to the channel receive path. The transmit signal is still connected to the transmit path and reaches the remote user. While the loop is connected, the local user equipment must receive its own signal. The loop signal path is shown in *Figure 5-5*. This loop provides a quick check of the connections to the local user equipment.

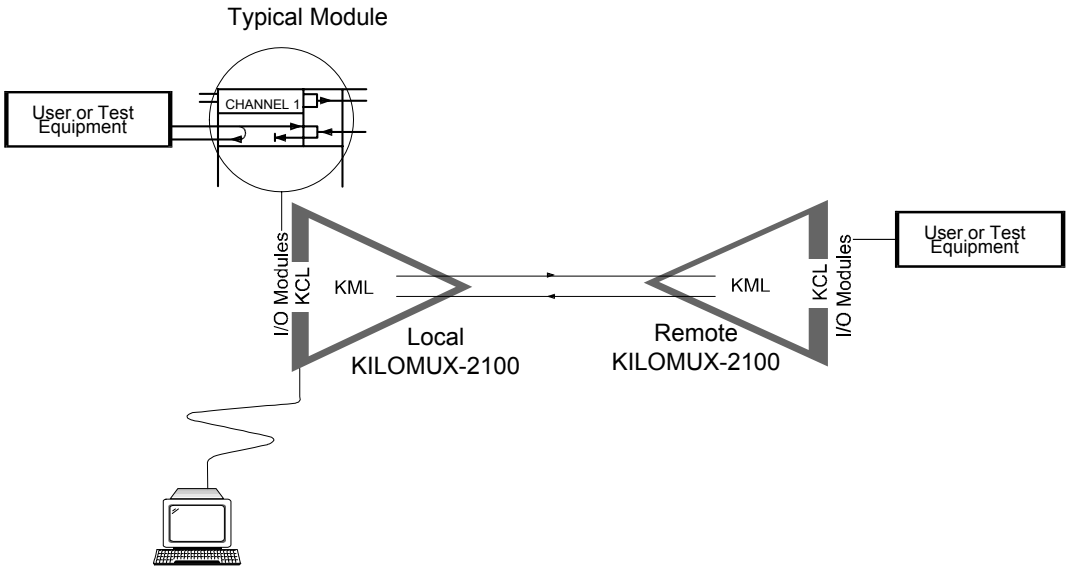


Figure 5-5. I/O Module, Local Loop on Individual Channel

Remote Channel Loop

The remote loop is connected on the local Kilomux unit, i.e., the local I/O module returns the receive signal of the tested channel toward the remote Kilomux. The loop signal path is shown in *Figure 5-6*. This loop allows the remote user to perform a quick check of the end-to-end transmission on this channel.

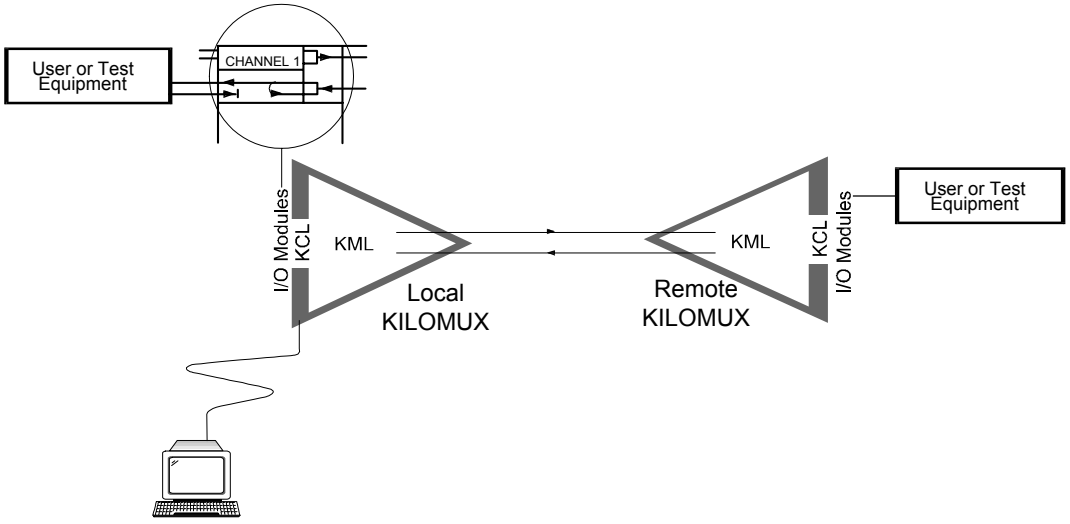


Figure 5-6. I/O Module, Remote Loop on Individual Channel

PRBS Transmission

The PRBS transmission function is used to provide a test signal to a channel of a data I/O module. By activating a local or remote main link loop, or a remote channel loop (or by connecting an external loop) while PRBS transmission is activated, this function can also be used to obtain a qualitative evaluation of data transmission without using external test equipment.

Data transmission is checked by applying a 2^9 - 1 (511) bit pseudo-random sequence generated by an internal test sequence generator to the input of the tested channel transmit path. The transmitted data is returned by means of a loop somewhere along the data path (e.g., by connecting a remote channel loop if downloading is enabled, or a local main link loop) to the receive path of the module. The received signal is routed to a test sequence evaluator. The evaluator compares the received data, bit by bit, to the original data and detects any difference (bit error). The output of the evaluator is sampled during module polling, to check whether errors were detected in the interval between consecutive pollings.

The test results are displayed as follows:

- On the LCD located on the Kilomux front panel, the result is displayed either as GOOD (no error has been detected during the last interval), or BAD (at least one error has already been detected). Note that if no loop is present along the signal path, the BAD result is expected, and does not indicate any problem.
- On a supervision terminal, the test results are displayed as a number in the range of 0 (no errors detected during the current measurement interval) through 9999. The number of errors is accumulated from the activation of the PRBS transmission.

During PRBS transmission, the tested channel is disconnected from the user data equipment, and the DSR line is turned off. At any time, PRBS transmission can be activated on only one channel of each data I/O module installed in the Kilomux unit.

BERT Testing

The BERT test is used to evaluate data transmission through a selected channel of a data I/O module without using external test equipment. The BERT test can be activated only when the downloading function is enabled, and the link to the remote Kilomux operates normally.

The BERT test is similar to the PRBS transmission test, except that before the evaluation of the received data starts, a remote channel loop is activated. This should cause the sequence to be transmitted along the full path. The test results are displayed as for PRBS transmission.

As for PRBS transmission, the BERT test can be activated on only one channel of each data I/O module installed in the Kilomux unit, the tested channel is disconnected from the user data equipment, and its DSR line is turned off.

Tone Injection

The test tone is a data sequence repeating at a rate of 1 kHz. This data sequence is identical to the data sequence that would have been generated if a 1 kHz signal having a nominal level of 1 mW (0 dBm0) were applied to the input of the channel codec.

The test tone is connected directly to the output of the tested channel transmit path, instead of transmitting the subscriber transmit signal. The tone can be connected to only one channel of a voice module at a time. Tone injection automatically disconnects the local subscriber signal. *Figure 5-7* shows the signal paths.

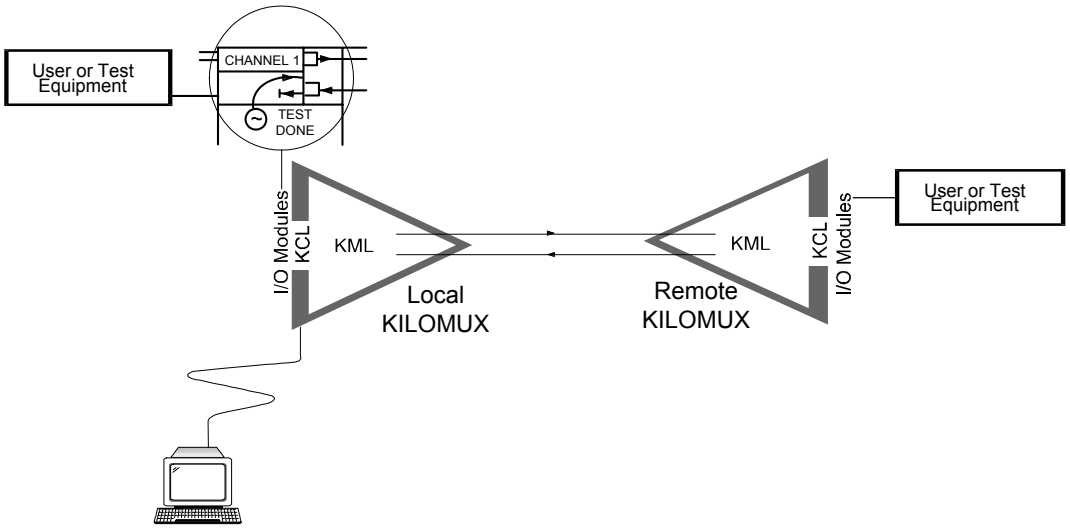


Figure 5-7. Voice I/O Module, Test Tone Injection Path

Appendix A
Connection Data

A.1 Scope

This appendix provides information on the type and pin allocation of the interface connectors installed on the various Kilomux modules.

In the direction field, the following conventions are used:

- IN – input to Kilomux
- OUT – output from Kilomux.

A.2 Supervisory Port Connector

The module supervision connector is a 9-pin D-type female connector, designated Supervisory Port Connector (CONTROL DCE).

- The allocation of pins in the Supervisory Port Connector with DCE emulation (used for direct connection to the supervisory terminal) is given in *Table A-1*.
- The pin functions with DTE emulation (used when a cross-over cable is used for connection to a modem that provides the link to the supervisory terminal) is given in *Table A-2*.

Table A-1. Common Logic Module KCL.2, Supervisory Port Connector Pin Allocations for DCE Emulation

Pin	Designation	Direction	Connected to Terminal with 25-pin Connector
1	Data Carrier Detect (DCD)	From Kilomux	8
2	Receive Data (RD)	From Kilomux	3
3	Transmit Data (TD)	To Kilomux	2
4	Data Terminal Ready (DTR)	To Kilomux	20
5	Signal Ground (SIG)	Common reference and DC power supply ground. Can be isolated from chassis ground (AA) (strap-selectable)	7
6	Data Set Ready	From Kilomux	6
7	Request to Send (RTS)	To Kilomux	4
8	Clear to Send (CTS)	From Kilomux	5
9	Ring Indicator (RI)	To Kilomux	22

Table A-2. Common Logic Module KCL.2, Supervisory Port Connector Pin Allocations for DTE Emulation

Pin	Designation	Direction	Function
1	FGND	–	Frame ground
2	TD	IN	TX data
3	RD	OUT	RX data
4	DCD	IN	Carrier detect
5	CTS	–	Not connected
6	DTR	OUT	Data terminal ready
7	SGND	–	Signal ground
8	RTS	OUT	Request to send
9	+12V	OUT	See Note below
10	-12V	OUT	See Note below
11	RELAY M	IN/OUT	Alarm relay NC contact
12	RELAY F	IN/OUT	Alarm relay common
13	RELAY B	IN/OUT	Alarm relay NO contact
14	ALARM	OUT	Alarm indication
20	DSR	IN	Data set ready
25	RI	IN	Ring indicator

Note *Pins 9, 10 are connected to the +12V and -12V lines through a 300Ω, 1/2W series resistor.*

Direction: IN - input to Kilomux
OUT - output from Kilomux.

A.3 MNG Connector

The MNG connector is a 9-pin female connector, intended for direct connection to a dial-up modem:

- The connection of the MNG connector to a dial-up modem terminal having a 9-pin connector is made by means of a straight cable.
- The connection to a dial-up modem with 25-pin connector should be made using a cable wired in accordance with the ***Connection to Dial-up Modem with 25-pin Connector*** column of *Table A-3*.

Table A-3. Common Logic Module KCL.2, MNG Connector Pin Allocations

Pin	Line	Direction	Connection to Dial-Up Modem with 25-pin Connector
1	Data Carrier Detect (DCD)	IN	8
2	Receive Data (RD)	IN	3
3	Transmit Data (TD)	OUT	2
4	Data Terminal Ready (DTR)	OUT	20
5	Signal Ground (SIG)	Common reference and DC power supply ground	7
6	Data Set Ready	IN	6
7	Request to Send (RTS)	OUT	4
8	Clear to Send (CTS)	IN	5
9	Ring Indicator (RI)	IN	22

A.4 Alarm Relay Connector

The Alarm Relay connector is a 6-pin RJ-12 connector with dry contacts for relaying alarms from the Kilomux to activate external equipment. The Alarm Relay connector can also be used to relay external equipment information to the Kilomux. Connector pin functions are given in the following table.

Table A-4. Alarm Relay Connector Pinout

Pin	Direction	Designation	Function
1	Out	+5V	+5 VDC output
2	In/Out	Relay F	Main relay –Common contact
3	In/Out	Relay M	Main relay – NC (Normally Closed) contact
4	In/Out	Relay B	Main relay – NO (Normally Open) contact
5	In/Out	FGND	–
6	In	FAN	Fan status input, active low (TTL)

A.5 DC Power Input Connector

The DC input power connector used on the KM-2104 and the KPS.3, KPS.5, KPS.7, and DC-powered KM-Ringer modules, is a 3-pin terminal block type connector. Connector pin functions are marked on the panel. Refer to the *DC Power Supply Connection Supplement* at the end of this manual for details.

Appendix B
Alarms

B.1 Alarm Messages

Table B-1 lists the Kilomux alarm messages. For each alarm, an alarm text message is displayed on the terminal. In addition to the text, each message has a code number. *Table B-1* lists the messages in ascending order of their code numbers, and in addition, indicates their type (state or event) and lists the actions required to correct the alarm condition. Perform the corrective actions in the given order, until the problem is corrected.

Note *In the following table,* **i** *indicates the slot number contained in the alarm message.*

Table B-1. Alarm Messages

Code	Message - Terminal	Alarm Type	Description
1	HARDWARE FAILURE, SLOT i	State	A technical failure has been detected in the module installed in the specified slot (ML-A, ML-B, 1 through 12). Replace the module
2	LOCAL SYNC LOSS	State	The KML module installed in the specified slot (ML-A, ML-B) lost synchronization to the incoming data stream. May indicate a configuration error or a technical failure
3	B.R.G FAILURE, SLOT i		The baud rate generator of the module installed in the specified I/O slot (1 through 12) failed. Replace the module
4	PS-A 5V FAILURE	State	The 5V voltage provided by the KPS-A module is missing or is out of the allowable limits. Replace the module
5	PS-A 12V FAILURE	State	One or both of the ±12V voltages provided by the KPS-A module is missing or is out of the allowable limits. Replace the module
6	PS-B 5V FAILURE	State	The 5V voltage provided by the KPS-B module is missing or is out of the allowable limits. Replace the module
7	PS-B 12V FAILURE	State	One or both of the ±12V voltages provided by the KPS-B module is missing or is out of the allowable limits. Replace the module

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
8,9	DB 1 CHKSUM ERROR DB 2 CHKSUM ERROR	Event	The checksum of one of the data bases stored by the KCL module does not match the checksum calculated after power-up. The default data base must be loaded
10	BANDWIDTH OVERFLOW	State	The total bandwidth required for the active channels exceeds the main link data rate. Change channel configuration as required, or increase the main link data rate
11	ALARM BUFFER OVERFLOW	State	The number of alarms stored in the Kilomux alarm buffer exceeds the maximum allowable number (100). New alarms are now written over previous alarms
12	CLOCK WAS CHANGED TO FALLBACK	State	The fallback timing reference source has been selected for use
13	CLOCK WAS CHANGED TO INTERNAL	State	The internal oscillator is now used as a timing reference source, as a result of the simultaneous failure of both the master and fallback clock sources
14	CL HARDWARE FAILURE	State	A technical failure has been detected in the KCL module circuits. Replace the module
15	REMOTE SYNC LOSS, SLOT i	State	The KML module installed in the specified slot (ML-A, ML-B) of the remote Kilomux unit lost synchronization. This message is displayed only when downloading is enabled
16	DOWNLOAD ERROR	State	Errors are detected in the data received through the management channel
17	I/O SYNC LOSS, SLOT i	State	The KLS.2 module installed in the specified I/O slot (1 through 12) of the local Kilomux unit lost synchronization
18	MAIN LINK FLIP OCCURRED	Event	The Kilomux switched to operation on the second main link. This message can be displayed only when the redundancy mode is used
19	ML LOSS OF SIGNAL, SLOT i	State	The KML.5 module installed in the specified slot (ML-A, ML-B) does not receive data (only for KML.5 module)
20	MODULE WAS REMOVED, SLOT i	Event	The module that was previously installed in the specified slot (ML-A, ML-B and 1 through 12) has been physically removed, or has been reset, or the communication with the module failed
21	MAIN LINK BACKUP DIAL FAILURE	Event	The connection of the switched backup link failed. This message can be displayed only when the switched backup mode is selected

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
22	SWITCHED BACKUP ML IS ACTIVE	Event	The switched backup link has been successfully connected and is actively carrying traffic. This message can be displayed only when the switched backup mode is selected
23	MAIN LINK RECOVERY	Event	The main link has returned to normal operation. This message can be displayed only when the switched backup or priority bumping mode is selected
24	MAIN LINK FLIP, ML-A	Event	Main link A is now the active link, after a flip from link B. This message can be displayed only when the priority bumping mode is selected
25	MAIN LINK FLIP, ML-B	Event	Main link B is now the active link, after a flip from link A. This message can be displayed only when the priority bumping mode is selected
26	DATABASE SWITCH TO DATABASE 1	State	The local Kilomux unit automatically switched to data base 1, in accordance with the time specified by means of the DEF DB FLIP
27	DATABASE SWITCH TO DATABASE 2	State	The local Kilomux unit automatically switched to data base 2, in accordance with the time specified by means of the DEF DB FLIP
28	PSWRD SWITCH IS ON	Event	The PSWRD switch of the KCL module is ON. This enforces the default password
29	SP-PAR SWITCH IS ON	Event	The SP-PARM switch of the KCL module is ON. This enforces the default supervisory port parameters
30	DB-INIT SWITCH IS ON	Event	The DB-INIT switch of the KCL module is ON. This will result in the loading of the default data base parameters when the Kilomux will be turned on or reset
31	REAL TIME CLOCK BATTERY FAILURE	Event	The voltage of the battery that provides power to the internal real time clock is too low for proper operation and must be replaced as soon as possible. The battery test is performed during the power-up test only
32	VOICE SYNC LOSS, CH	State	The channel specified by j (1 or 2) of the voice module installed in the I/O slot specified by i (1 through 12) of the local Kilomux unit lost synchronization
33	TAIL-END MODEM ON LOOP, CH	State	The tail-end modem connected to the channel specified by j (1 or 2) of the KLS.1 module installed in the I/O slot specified by i (1 through 12) of the local Kilomux unit reports a loop

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
35	IDLE SEQUENCE, SLOT i	State	The KML.6 module installed in slot (ML-A, ML-B) reports the recognition of an idle code in the data received from the network
36	ML OUT OF SERVICE, SLOT i	State	The KML.6 module installed in slot (ML-A, ML-B) reports the recognition of an out-of-service code in the data received from the network
37	ML OUT OF FRAME, SLOT i	State	The KML.6 module installed in slot (ML-A, ML-B) reports the recognition of an out-of-frame code in the data received from the network
38	DSU LOOPBACK, SLOT i	State	The KML.6 module installed in slot (ML-A, ML-B) performs a DSU loopback in response to a network DSU loopback request
39	KTRE/KMBE LINK ERROR, SLOT i	State	The KTRE or KMBE module installed in I/O slot (1 through 12) of the local Kilomux unit has lost communication with the remote side
40	KTRE/KMBE LAN ERROR, SLOT i	State	The KTRE or KMBE module installed in I/O slot (1 through 12) of the local Kilomux unit reports that the LAN insertion process failed
41	KDI FRAME OVERFLOW	Event	Frame overflow occurred. This usually happens because the timing of link A is not locked to the timing of link B
42	PIGGY-BACK HARDWARE ERROR A	State	The KML.7 module installed in the specified slot reports a hardware problem on the T1 interface board
43	NETWORK LLB, SLOT i	Event	A network-initiated line loopback has been activated. This loopback cannot be disconnected by the system management
44	NETWORK PLB, SLOT i	Event	A network-initiated payload loopback has been activated. This loopback cannot be disconnected by the system management
45	DRIVER FAIL, SLOT i	State	The KML.8 module installed in the specified I/O slot reports a hardware failure in the E1 line driver
46	SIGNAL LOSS, SLOT i	State	The KML.8 module installed in the specified slot reports a loss of input signal
47	EXECIVE BPV, SLOT i	State	The number of coding errors detected in the main link signal received by the active main link module is too high (the bipolar violation rate exceeds 1×10^{6} for 1000 consecutive seconds). This may indicate a fault in the link or in the link transmission equipment, or a failure in the active main link module
48	AIS OCCURED, SLOT i	State	The Alarm Indication Signal (AIS), a framed “all ones” sequence, is received on the main link

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
49	AIS RED ALM, SLOT i	State	The local frame synchronization has been lost because of AIS reception
50	AIS SYNC LOSS, SLOT i	State	The local frame synchronization has been lost because of AIS reception
51	RED ALARM, SLOT i	State	Local main link module lost synchronization to incoming data stream. May indicate a configuration error or a technical failure. For T1 links, this condition is the red alarm
52	E1 LOCAL SYNC LOSS, SLOT i	State	Local main link module lost synchronization to incoming data stream. May indicate a configuration error or a technical failure. For T1 links, this condition is the red alarm
53	LOCAL MF S.LOSS, SLOT i	Event	On an E1 link operating with 256S framing, the local module has lost multiframe synchronization
54	REMOTE MF S.LOSS, SLOT i	Event	On an E1 link operating with 256S framing, the remote equipment has lost multiframe synchronization
55	YELLOW ALARM, SLOT i	State	Remote equipment lost synchronization to the incoming data stream. May indicate a configuration error or a technical failure. For T1 links, this condition is the yellow alarm
56	E1 REMOTE SYNC LOSS SLOT i	State	The KML.8 module installed in the specified slot reports remote loss of frame alignment (ML-A, ML-B)
57	FRAME SLIP, SLOT i	Event	A main link frame slip has occurred. This is usually caused by incorrect selection of clock sources
58	BPV ERROR, SLOT i	State	The number of coding errors detected in the main link signal received by the active module is too high (the bipolar violation rate exceeds 1×10^{-6} for 1000 consecutive seconds). This may indicate a fault in the link or in the link transmission equipment, or a failure in the active main link module
59	EXECIVE ERR RATIO, SLOT i	State	The error rate detected on the frame synchronization bits is high (as defined by ITU-T Rec. G.732), and may indicate hardware problems or defective connections
60	CRC-4 ERROR, SLOT i	Event	The main link module reports the detection of a CRC error
61	SFIFO B.R.G FAIL, SLOT i	State	The baud rate generator of the specified module failed. Replace the module

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
62	SFIFO SLIP, SLOT i	Event	The KML.7 module installed in the specified slot reports that a slip occurred in the SFIFO
63	INTERNAL CLOCK IN USE, SLOT i	State	The internal oscillator has been selected as a timing reference sources, as a result of simultaneous failure of both the master and fallback clock sources
64	DP CYCLE DIAL FAILED	Event	The dial-out cycle failed, and the redial attempts stopped until a new alarm reported
65	DP PRIMARY CALL FAILED	Event	The call setup attempts to the primary dial-out directory number failed
66	DP ALTERNATE CALL FAILED	Event	The call setup attempts to the alternate dial-out directory number failed
67	FRAMER CARD FAILED	State	The master KVF.5 module failed
68	MGMT PORT IS LOOPED ML-i	State	Management port is looped and cannot communicate with the remote Kilomux due to loopback activation on main link A or B
69	MGMT PORT IS DOWN ML-i	State	Kilomux cannot communicate to the remote Kilomux via in-band management channel in main link A or B
70	AGENTS WITH SAME NAME IN NET	Event	There is an agent with the same name in the network
71	CONTOLR TAKEN BY SNMP MMI	Event	Kilomux is controlled by SNMP management station
72	CONTOLR TAKEN BY TERM MMI	Event	Kilomux is controlled by ASCII terminal
73	CONTOLR TAKEN BY LCD MMI	Event	Kilomux is controlled by LCD
74	KCL WARE ERROR:KCL	State	Hardware error occurred during self test of COMMON LOGIC Card
75	HARDWARE ERROR:IO-i	State	Hardware error occurred during self test of I/O-i (slot 1 through 12) card. It can also occur due to a slip in the NSFIFO chip on the card
76	HARDWARE ERROR:ML-i	State	Hardware error occurred during self test of Main Link-i (ML-A or ML-B) card. It can also occur due to a slip in the NSFIFO chip on the card
77	ALARM BUFFER EMPTY	Event	Appears when the user requests the alarm buffer list from a RADview station and the list is empty
78	FRAGMENTATION IN FRAME ALLOCATION	Event	Fragmentation in frame allocation of main link. Can occur when boding is enabled in KML.10 parameters

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
79	RED ALARM, SLOT:	State	Local KVF.5 master module lost synchronization to incoming data stream. For KVF.5/T1/M card, condition is red alarm
80	YELLOW ALARM, SLOT:	State	The remote PBX that connects to KVF.5 module, lost synchronization to incoming data stream. For KVF.5/T1/M card, condition is yellow alarm
81	FRAME SLIP, SLOT:	State	The number of the SLIP detected in the frame that connects from PBX to KVF.5 card in the slot
82	BPV ERROR, SLOT:	State	The number of coding errors detected in the line that connects from PBX to the KVF.5 card in the slot
83	PHASOR OVERFLOW, SLOT:	Event	Internal overflow in the specified module buffer, (slot number 1 through 12), due to difference in clock rates or insufficient buffer size. Make sure that the timing modes of the Kilomux main link and I/O module are compatible
84	PORT SYNC LOSS, PORT	State	ISDN port sync loss
85	FANS FAILURE	Event	The FAN that connected to Kilomux failed
86	PORT LOSS OF SIGNAL	State	Loss of port signal is received when signal is less than 15 dB (X2-T6164)
87	OVERFLOW, PORT :	State	Port over/under flow
88	VOICE SYNC LOSS, PORT :	State	The port specified by j (1..8) of the voice module installed in the I/O slot specified by i (1..12) of the local Kilomux, lost synchronization
89	CRC ERROR, SLOT :	Event	The I/O module reports detection of a CRC error
90	SIGNAL LOSS, SLOT :	State	The I/O module installed in the specified slot reports a loss of input signal
91	AIS ALARM, SLOT :	State	The Alarm Indication Signal (AIS), a framed "all ones" sequence, is received on the I/O module
92	AIS RED ALARM, SLOT :	State	The local frame synchronization has been lost because of AIS reception
95	TDM DEVICE SLIP, PORT :	State	The internal TDM component related to the port specified by j (1..8) of the voice module installed in the I/O slot specified by i (1..12) of the local Kilomux, reports a slip error
96	REMOTE SYNC LOSS, PORT :	???	???

Table B-1. Alarm Messages (Cont.)

Code	Message - Terminal	Alarm Type	Description
97	CCS COMPRESSION OVERFLOW PORT	STATE	The effective bandwidth required by the CCS signaling exceeds the available bandwidth on the CCS channel
98	JITTER BUFFER UNDERFLOW	STATE	Ethernet frames were dropped because the receive buffer of the KML.11 was in underrun state
99	JITTER BUFFER OVERFLOW	STATE	Ethernet frames were dropped because the receive buffer of the KML.11 was in overrun state
100	SEQUENCE ERROR	STATE	Ethernet frames received at the corresponding KML.11 interface are not in the right order
101	FCS ERROR	STATE	Ethernet frames received at the corresponding KML.11 Interface failed the frame checksum (FCS) check (parameter defined as per RFC 2665)
102	ALIGNMENT ERROR	STATE	Ethernet frames received at the corresponding KML.11 interface are not an integral number of octets in length (RFC 1643).

B.2 Configuration Error Messages

The Kilomux provides configuration error messages for the LCD and for the supervision terminal.

- The configuration error messages displayed on the LCD have the format CONFIG ERROR, followed by a numerical code.
- The configuration messages have the format ERROR, followed by the numerical code, and a concise textual description of the error condition.

The error messages are explained below:

ERROR 01 ILLEGAL MASTER CLOCK SOURCE (CARD TIMING/SPEED)

Illegal source for a master clock timing reference source: the selected channel is not operating in the DTE2 mode.

ERROR 02 ILLEGAL FALLBACK CLOCK SOURCE (CARD TIMING/SPEED)

Illegal source for a fallback clock timing reference source: the selected channel is not operating in the DTE2 mode.

ERROR 03 ILLEGAL ML LOOP COMBINATION

You are trying to activate simultaneously local and main link loops, or both types of ITU-T Rec. V.54 main link loops (LOOP 2 and LOOP 3). This combination is not allowed (refer to the *Diagnostics* chapter).

ERROR 04 ILLEGAL I/O MODULE LOOP COMBINATION

You are trying to activate simultaneously both a local and remote loop or PRBS transmission, or BERT test, or tone injection, on the same channel. None of these combinations are allowed (refer to the *Diagnostics* chapter).

ERROR 05 ILLEGAL COMBINATION OF CHANNEL SPEED AND PROTOCOL

Conflict in the channel parameters of the KLS.1 module being configured: you are trying to select a data rate of 38.4 kbps, but the channel is configured for asynchronous operation. The maximum data rate for asynchronous operation is 19.2 kbps.

ERROR 06 ILLEGAL NUMBER OF MODULE CONTROL SIGNALS

The number of control signals that can be transmitted for any module is none, 1, 2 or 4. You are trying to select a forbidden value, e.g., you cannot select RTS on one channel of a given module, and DTR and RTS on another channel of the same module.

ERROR 07	BANDWIDTH OVERFLOW - ML-<A or B; nothing or PRIORITY>

The total bandwidth required for the active channels exceeds the main link data rate. Change channel configuration as required, or increase the main link data rate.
During the definition of channel connections (DEF CON command):

- For dual-link operation: the number of channels you want to connect to a given main link requires a bandwidth that exceeds the available main link bandwidth.
- For priority bumping operation: the number of channels assigned HIGH priority requires a bandwidth that exceeds the available main link bandwidth.

ERROR 08	MASTER AND FALLBACK CLOCKS ARE SAME

You cannot select the same data channel as both main and fallback reference timing source.

ERROR 09	ILLEGAL COMBINATION OF CHANNEL AND ML-<A or B> SPEED

- You are trying to select a channel rate of 192 kbps on a KHS.1 channel while the main link data rate is 256 kbps. This combination is not allowed; therefore you must either increase the main link data rate or reduce the channel rate.
- You are trying to connect a KVC.1 card when the main link data rate is higher than 384 kbps. This combination is not allowed.

ERROR 10	ILLEGAL LOOP COMBINATION INVOLVING ML REMOTE LOOP

You are trying to activate (on either Kilomux) an illegal combination of loops which includes the remote main link loop (refer to the *Diagnostics* chapter).

ERROR 11	ILLEGAL LOOP COMBINATION INVOLVING ML LOCAL LOOP

You are trying to activate (on either Kilomux) an illegal combination of loops that includes the local main link loop. This combination is not allowed (refer to the *Diagnostics* chapter).

ERROR 12	ILLEGAL LOOP COMBINATION INVOLVING I/O REMOTE LOOP

You are trying to activate (on either Kilomux) an illegal combination of loops that includes a remote channel loop (refer to the *Diagnostics* chapter).

ERROR 13	ILLEGAL LOOP COMBINATION INVOLVING I/O BERT

You are trying to activate a BERT test on both Kilomux units.

ERROR 14	ILLEGAL LOOP COMBINATION INVOLVING ML V.54 LOOP2

You are trying to activate (on either Kilomux) an illegal combination of loops that includes a main link ITU-T Rec. V.54 loop 2 (refer to the *Diagnostics* chapter).

ERROR 15	ILLEGAL LOOP COMBINATION INVOLVING ML V.54 LOOP3

You are trying to activate (on either Kilomux) an illegal combination of loops that includes a main link ITU-T Rec. V.54 loop 3 (refer to the *Diagnostics* chapter).

ERROR 16	ILLEGAL KLS.2 COMPOSITE AND ML-<A or B> SPEED COMBINATION

The Kilomux main link rate is 256 or 384 kbps, and you are trying to configure a KLS.2 module for a composite data rate of 2.4 kbps. This combination of main link and composite data rates is not allowable, because it would require oversampling.

ERROR 17	ML MODE NOT COMPATIBLE WITH I/O SLOT LINK SELECT

The selected main link mode is not compatible with the selections made for the I/O modules, i.e., some modules have been connected to main link A and others to main link B, but the current main link mode is SINGLE, REDUNDANCY, or SWITCHED BACKUP.

ERROR 18	TIMING/SPEED NOT COMPATIBLE WITH ML MODULE TYPE

You are trying to select a timing mode and/or speed that is not supported by the installed KML module.

ERROR 19	ILLEGAL ML MODE FOR WORKING WITH LCD

The main link mode selected by the operator on the Kilomux front panel is not allowed, because the required parameters cannot be defined using the front panel controls and the LCD.

ERROR 20	ILLEGAL COMMAND, MODULE NOT INSTALLED

The slot whose number has been specified in the command is empty.

ERROR 21	ILLEGAL COMMAND, CHANNEL IS DISCONNECTED

The channel whose number is specified in the command is not connected (NC). You must connect the channel before specifying its number in a configuration command.

ERROR 22	LOOP IS NOT ACTIVE

You are trying to deactivate a loop that currently is not activated.

ERROR 23	ILLEGAL LOOP FOR INSTALLED MODULE

The loop you are trying to activate is not supported by the module whose number has been specified in the command.

ERROR 24	ILLEGAL COMMAND FOR CURRENT ML MODE

The command you have entered is not allowed in the current main link mode.

ERROR 25	CONFLICT BETWEEN CTRL_SIG PARAMETER AND MODULE TYPE

The value entered in the CONTROL SIGNALING field is not supported by the module whose number has been specified in the command.

ERROR 26	MODULE TYPE MISMATCH BETWEEN DATABASE AND HARDWARE

The module type recorded in the Kilomux data base differs from the module sensed by the Kilomux.

ERROR 27	ILLEGAL CLOCK SELECTION FOR MODULE TYPE

The selected timing mode is not supported by the module whose number has been specified in the command.

ERROR 28	ILLEGAL COMMAND FOR INSTALLED MODULE

The command you have entered is not supported by the module whose number has been specified in the command.

ERROR 30	ILLEGAL DCD_DEL AND INTERFACE COMBINATION

The DCD_DEL parameter is not supported by the selected supervisory port interface (the DCD DEL parameter must be 0 when the supervisory port interface is DCE).

ERROR 31	ILLEGAL COMMAND, DOWNLOAD NOT SUPPORTED

The command you have entered cannot be executed when downloading is disabled.

ERROR 32	ILLEGAL PROTOCOL AND TIMING COMBINATION

You are trying to select a channel timing mode for a data channel configured for asynchronous operation.

ERROR 33	REDUNDANT ML NOT INSTALLED

No redundant KML module is installed.

ERROR 34	DISCONNECT LOOP BEFORE CONFIGURATION CHANGE

You are trying to change the configuration while a loop is activate this is not allowed.

ERROR 35	ILLEGAL TIME DIVISION DEFINITION (<day>)

The periods defined by means of the DEF AGENDA commands are not correctly sequenced.

ERROR 36	ILLEGAL DATA BASE FLIP TIME

You must define two valid data base flip times.

ERROR 37	CONFLICT IN INTERFACE AND DSR PARAMETER

You are trying to select DSR=ON after the supervisory port interface has been set to DTE.

ERROR 38	ILLEGAL COMMAND, ALTERNATE DATA BASE IS ACTIVE

The command entered by you is not supported on the alternate database (only DEF commands are supported).

ERROR 39	ILLEGAL COMMAND FOR CURRENT SYSTEM TYPE

The command entered by you is not supported by the Kilomux-2104.

ERROR 41	ILLEGAL COMMAND NO CONNECTED CHANNELS

You are trying to enter a command that is supported only when the channel specified in the command is connected.

ERROR 42	CONFLICT IN FRAME MODE AND DOWNLOAD

You can select manual frame bit allocation only when downloading is disabled.

ERROR 43	ILLEGAL FRAME ALLOCATION

An incorrect bit allocation has been detected, i.e., the same bits have been assigned to different channels, or the specified start or end bit number is invalid.

ERROR 44	ILLEGAL LINK CLOCK AND ML MODE COMBINATION

You can select the main link clock source only when using the dual-link or priority bumping mode, provided a KDI module is installed in the Kilomux.

ERROR 45	ILLEGAL LINK CLOCK AND ML TIMING COMBINATION

When selecting one main link as the clock source, the timing mode of the other main link cannot be DTE or LBT.

If both main links use LBT or DTE timing, the LINK_CLK parameter must be set to NONE.

ERROR 48	IP ADDRESS AND GATEWAY ARE NOT AT THE SAME SUBNET

The main link's link address and the gateway main link's IP address need to be at the same subnet. The subnet is the first three fields of the IP address.

ERROR 50	ILLEGAL COMBINATION OF INTERFACE AND ECHO CANCELLER

You are trying to disable the echo canceller of a voice module, e.g., KVC.2, etc., when its interface is 2-WIRE. This is not allowable, because when the link connecting between the subscribers includes hybrids, the quality of transmission without echo cancellers is degraded.

ERROR 51	ML_MODE AND HARDWARE CONFIGURATION CONFLICT

The Kilomux is equipped with only one KML module, but you are trying to select a main link mode that requires two KML modules (i.e., only the SINGLE mode is allowed).

ERROR 52	CONFLICT BETWEEN CH1 AND CH2 SPEEDS

- You are trying to configure channels 1 and 2 of a KLS.1 module to operate with data rates from different groups. This is not allowed.
- For the KVF.4/S0 module, you cannot select a 64 kbps rate for both the B1 and B2 channel.

ERROR 56	ILLEGAL START TIME SLOT ALLOCATION

You are selecting an incorrect starting time slot on the KVF.5 master module.

ERROR 58	ILLEGAL SIGNALING MODE

You are selecting an incorrect signaling parameter in KVF.5 or KVF.6 modules.

ERROR 59	CONFLICT BETWEEN GROUPS DESTINATION

You are selecting a time slot group that is already connected (KVF.5 and KVF.6 cards).

ERROR 60	FRAGMENTATION IN FRAME

Kilomux can not use the full free frame space for current configuration.

ERROR 201	ML SPEEDS SHOULD BE THE SAME

The main link data rates configured on two Kilomux connected in a link must be equal.

ERROR 202	ML TIMINGS SHOULD BE DIFFERENT

The timing modes of two Kilomux connected in a link must be different. In particular, do not select the INT source at both ends of a link when KML.5, KML.6, KML.7, or KML.8 modules are used.

ERROR 203	LOCAL AND REM SLOTS OR PARAMETERS NOT COMPATIBLE <parameter name>

The values assigned to the specified parameter in two Kilomux connected in a link are incompatible.

ERROR 204	LOCAL AND REM MUX ML MODES NOT COMPATIBLE

Incorrect main link configuration of Kilomux connected in a link:

- For drop & insert configuration, check that the main link mode for the dropping Kilomux is dual-link, and that the other units are configured for single link.
- For other configurations check that identical modes are used at both ends.

ERROR 205	ML-B>ML-A PRIORITY SHOULD EQUAL ML-A>ML-B PRIORITY

Select identical priorities for switching between the two links.

ERROR 206	FRAME ALLOCATION TYPE (AUTO-MANUAL) SHOULD BE THE SAME

The frame allocation mode of two Kilomux connected in a link must be identical and correct parameters must be selected:

- For automatic allocation, check the modules in the local and remote units have compatible offsets and parameters.
- For normal allocation, check that connected channels have compatible parameters.

ERROR 207	INCOMPLETE FRAME ALLOCATION

Check your manual frame bit allocation and correct.

ERROR 208	CONNECTED MUXES CANNOT BE BOTH REMOTE

Make sure that one of the Kilomux units connected in a link is defined as local, and the other as remote.

ERROR 209	CHANNEL SOURCE OF MASTER/FALLBACK CLOCK DOES NOT EXIST

You are trying to select a channel that is not physically present as the clock source.

ERROR 210	INVALID ML-B CARD TYPE FOR SWITCH BACKUP ML MODE

You can select the switched backed mode only when a KML.1, KML.2, KML.3 or KML.10 module is installed.

ERROR 211	ML MODE NOT COMPATIBLE WITH NO. OF ML

Before selecting the dual-link or priority bumping mode, make sure to configure two links.

ERROR 212	CONNECTED MUXES SHOULD HAVE THE SAME NO. OF CONFIGURATIONS

For two Kilomux connected in a link, always define the same number of data bases (either one or two data bases on each unit).

ERROR 213	KM2104 CAN HAVE ONLY ONE LINK

You are trying to define a second link on a Kilomux-2104. This is not supported.

ERROR 214	LOCAL-REM SLOTS OP. HIGHWAY OR ML PRIORITIES, INCOMPATIBLE

Check configuration of main link priorities for all the modules.

ERROR 215	KM2104 OFFSET, EDIT-AGENT MISMATCH

The current offset and the offset in the edited data base are different.

ERROR 218	ONLY ONE KDI/KDI.CH IS ALLOWED IN A MUX

Only one KDI or KDI/CH can be installed (or programmed) in a Kilomux.

ERROR 226	ML BITWEIGHT MISMATCH

When performing manual frame allocation, the two Kilomux connected in a link must have equal bandwidth allocation units (refer to the *General Information* chapter).

ERROR 234	KVF.5 SLAVE CARDS MUST HAVE A MASTER

Make sure a KVF.5/T1/M or KVF.5/E1/M module is installed.

ERROR 235	TOO MANY KVF.5 CARDS IN THE MUX

The total number of KVF.5 modules inserted in the Kilomux exceeds the maximum number needed to process the T1 or E1 signal.

ERROR 236	INVALID KVF.5 TS GROUP

You are trying to select an incorrect group of time slots on a KVF.5 slave module.

Appendix C
SNMP Management

C.1 Scope

This appendix provides the specific information required for the management of the Kilomux equipment by means of the Simple Network Management Protocol (SNMP).

C.2 SNMP Environment

General

Kilomux SNMP management functions are provided by an internal SNMP agent, located in the KCL.2 module.

SNMP management uses the User Datagram Protocol (UDP), which is a connections-mode transport protocol, part of the Internet Protocol (IP) suite of protocols. This section covers the information related to the SNMP environment.

SNMP Principles

The SNMP management protocol is an asynchronous command/response polling protocol: all the management traffic is initiated by the SNMP-based network management station (except for trap messages), which addresses the managed entities in its management domain. Only the addressed managed entity answers the polling of the management station.

The managed entities include a function called an SNMP agent, which is responsible for interpretation and handling of the management station requests to the managed entity, and the generation of properly-formatted responses to the management station.

SNMP Operations

The SNMP protocol includes four types of operations:

- getRequest - Command for retrieving specific management information from the managed entity. The managed entity responds with a getResponse message.
- getNextRequest - Command for retrieving sequentially specific management information from the managed entity. The managed entity responds with a getResponse message.

- setRequest - Command for manipulating specific management information within the managed entity. The managed entity responds with a setResponse message.
- trap - Management message carrying unsolicited information on extraordinary events (e.g., alarms) reported by the managed entity.

The Management Information Base

The management information base (MIB) includes a collection of ***managed objects***. A managed object is defined as a parameter that can be managed, such as a performance statistics value. The MIB includes the definitions of relevant managed objects. Various MIBs can be defined for various management purposes, types of equipment, etc.

An object's definition includes the range of values and the access rights:

- Read-only - Object value can be read, but cannot be set
- Read-write - Object value can be read or set
- Write-only - Object value can be set, but cannot be read
- Not accessible - Object value cannot be read, nor set.

MIB Structure

The MIB has an inverted tree-like structure, with each definition of a managed object forming one leaf, located at the end of a branch of that tree. Each leaf in the MIB is reached by a unique path, therefore by numbering the branching points, starting with the top, each leaf can be uniquely defined by a sequence of numbers. The formal description of the managed objects and the MIB structure is provided in a special standardized format, called Abstract Syntax Notation 1 (ASN.1).

Since the general collection of MIBs can also be organized in a similar structure, under the supervision of the Internet Activities Board (IAB), any parameter included in a MIB that is recognized by the IAB is uniquely defined.

To provide the flexibility necessary in a global structure, MIBs are classified into various branches, one of them being the experimental branch, and another, the private (enterprise-specific) branch. Under the private branch of MIBs, each enterprise (manufacturer) can be assigned a number. The assigned number designates the top of an enterprise-specific sub-tree of non-standard MIBs. Within this context, RAD has been assigned the enterprise number **`164`**. Therefore, enterprise MIBs published by RAD can be found under **`1.3.6.1.4.1.164`**.

MIBs of general interest are published by the IAB in the form of a Request for Comment (RFC) document. In addition, MIBs are also often assigned informal names that reflect their primary purpose. Enterprise-specific MIBs are published and distributed by their originator, who is responsible for their contents.

MIBs Supported by the Kilomux SNMP Agent

The interpretation of the relevant MIBs is a function of the SNMP agent of each managed entity. The general Kilomux SNMP agent currently supports RFC 1213 (the standard MIB-II).

In addition, the Kilomux SNMP agent supports the RAD-private (enterprise-specific) MIB identified as (read the following as a continuous string):
iso(1).org(3).dod(6).internet(1).private(4)
.enterprises(1).rad(164).radWAN(3)

Enterprise-specific MIBs supported by RAD equipment, including Kilomux, are available in ASN.1 format from the RAD Technical Support Department.

Management Domains Under SNMP

SNMP enables, in principle, each management station that knows the MIBs supported by a device, to perform all the management operations available on that device. However, this is not desirable in practical situations, so it is necessary to provide a means to limit the management domains.

SNMP Communities

To enable the delimitation of management domains, SNMP uses communities. Each community is identified by a name, which is a case-sensitive alphanumeric string defined by the user (the Kilomux SNMP agents support community names of up to 8 characters).

Any SNMP entity (this term includes both managed entities and management stations) can be assigned by its user community names.

Access Restriction Using SNMP Communities

In general, SNMP agents support two types of access rights:

- Read-only - The SNMP agent accepts and processes only SNMP getRequest and getNextRequest commands from management stations which have the same read-only community name.
- Read-write - The SNMP agent accepts and processes all the SNMP commands received from a management station with the same write community name. For each SNMP entity it is possible to define a list of the communities which are authorized to communicate with it, and the access rights associated with each community (this is the entity's SNMP community name table). For example, the SNMP community name table of the SNMP agent of the Kilomux can include three community names.

In accordance with the SNMP protocol, the SNMP community of the originating entity is sent in each message.

When an SNMP message is received by the addressed entity, first it checks the originator's community: if the community name of the message originator differs from the community name specified for that type of message in the agent, the message it discarded (SNMP agents of managed entities report this event by means of an authentication failure trap).

Kilomux Communities

The SNMP agent of the Kilomux is programmed to recognize the following community types:

- Read - SNMP community that has read-only authorization, i.e., the SNMP agent will accept only `getRequest` and `getNextRequest` commands from management stations using that community.
- Write - SNMP community that has read-write authorization, i.e., the SNMP agent will also accept `setRequest` commands from management stations using that community.
- Trap - SNMP community which the SNMP agent will send within trap messages.

C.3 IP Environment

General

The SNMP agent of the Kilomux can communicate either out-of-band, or in-band:

Out-of-Band

Out-of-band communication is performed via the serial ports 'Serial Link Internet Protocol' (SLIP) or Ethernet of the KCL.2 module.

In-Band

The user can select the main bandwidth allocated to management, and the transmission and routing management protocols.

The bandwidth for management can be one of the following: 2.4, 3.2, 4.8, 9.6 or 19.2 Kbps and depends on main link speed. The user can select the bandwidth for main link A and/or main link B.

The following are the minimum recommended management bandwidths:

- SNMP - 9.6 kbps
- TELNET - 4.8 kbps
- PING - 2.4 kbps

In the transmit direction, the SNMP agent encapsulates the management messages in frames and sends them at the selected rate through the selected main link (KML-A or KML-B).

IP Environment

IP Address Structure

Under the IP protocol, each IP network element (SNMP agents, network management stations, etc.) is called an IP host and must be assigned an IP address. An IP address is a 32-bit number, represented as four 8-bit bytes. Each byte represents a decimal number in the range of 0 through 255. The address is given in decimal format, with the bytes separated by decimal points, e.g., 164.90.70.47. This format is called ***dotted quad notation***.

An IP address is logically divided into two main portions:

- Network Portion. The network portion is assigned by the Internet Assigned Numbers Authority (IANA). There are five IP address classes: A, B, C, D, and E. However, only the classes A, B and C are used for IP addressing.
- Consult your network manager with respect to the class of IP addresses used on your network.
- The network portion of an IP address can be one, two or three bytes long, in accordance with the IP address class. This arrangement is illustrated in *Figure C-1*.

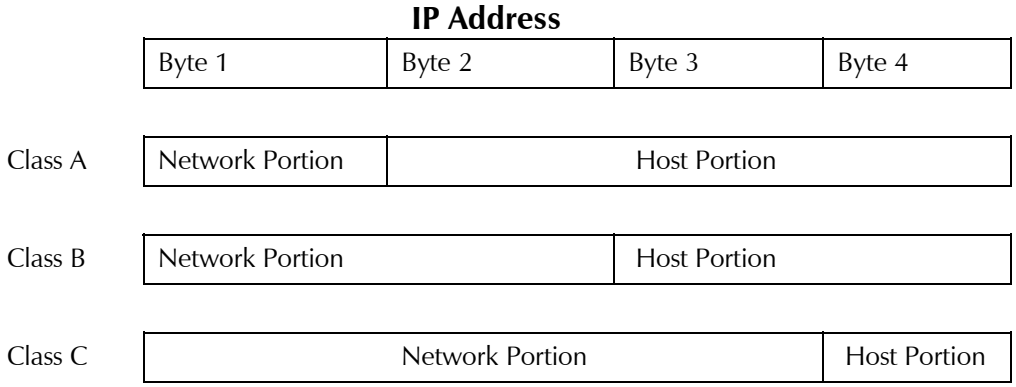


Figure C-1. IP Address Classes

The class of each IP address can be determined from its leftmost byte, in accordance with the following table.

Table C-1. IP Address Class

Address Class	First Byte	Address Range
Class A	0 through 127	0.H.H.H through 127.H.H.H
Class B	128 through 191	128.H.H.H through 191.H.H.H
Class C	192 through 223	192.H.H.H through 223.H.H.H

In the address range:

numbers - indicate bytes that are part of the network portion

H - indicates bytes that are part of the host portion.

- Host Portion. The host portion is used to identify an individual host connected to the network. The host identifier is assigned by the using organization, in accordance with its specific needs.

Note *The all-zero host identifier is always interpreted as a network identifier, and must not be assigned to an actual host*.

- Often, the host portion is further sub-divided into two portions:
  - Subnet Number - For example, subnet numbers can be used to identify departmental subnetworks. The subnet number follows the network identifier.
  - Host Number - the last bits of the IP address.

Net and Subnet Masks

Net and subnet masks are used to help filter the relevant traffic more efficiently: the function of the net and subnet mask is to specify how many of the IP address bits are actually used for the net identifier and for the subnet number.

The mask is a 32-bit word that includes "***ones***" in the positions used for net and subnet identifications, followed by "***zeros***" up to the end of the IP address.

For example, the subnet mask corresponding to the Class C IP address 194.227.31.67 is 255.255.255.000.

Recommendations for the Selection of IP Addresses

When the Kilomux SNMP agent and its management station are connected to the same network, the network identifier part of the IP address assigned to the SNMP agent must be identical to the network identifier part of the IP address of the management station.

However, the agent and the Kilomux SNMP management station can also be on different IP networks. In this case, each one will assigned IP addresses according to its IP network.

Automatic IP Traffic Routing

The SNMP agent of Kilomux includes an IP router function, used to route management messages automatically. The IP router function of each SNMP agent operates both on the in-band, as well as on the out-of-band traffic, depending if download bandwidth was enabled in the main link for management.

When using in-band communication, the IP router can receive the management traffic through each main link, via user-specified bandwidth of main link.

Subnet Addressing

When a large number of Kilomux units are managed by an SNMP management station, significant management traffic may be generated. Since large networks generally have more than one management station, the management traffic load becomes even higher. The usual approach to the management of a large network is to split the network into management domains, where each management station manages a predefined group of Kilomux units. In this case, from the point of view of system management, the network can be split into several subnetworks, as shown in *Figure C-2*.

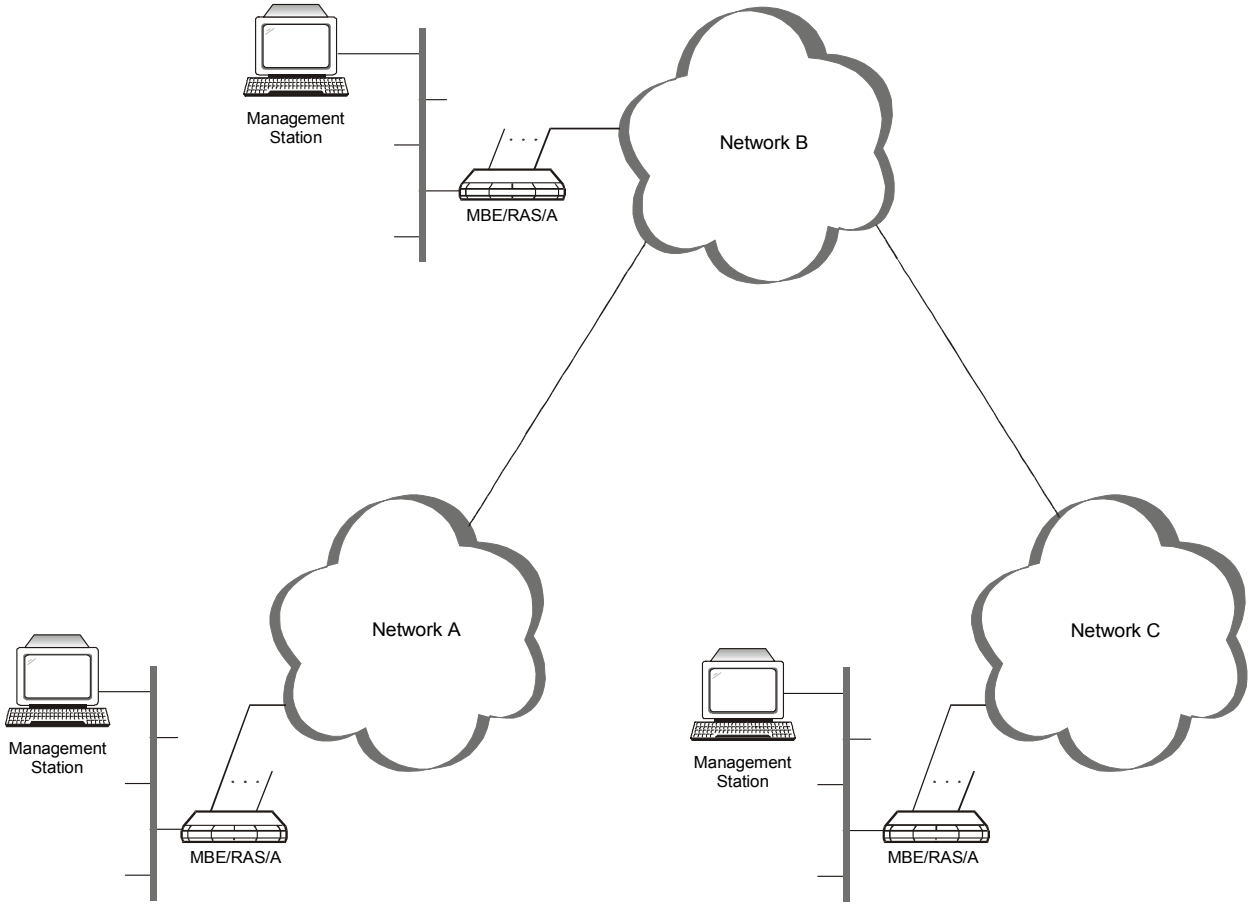


Figure C-2. Management System Topology Using Subnetting

For this purpose, the IP router function of Kilomux SNMP agents supports learning filters. A learning filter is defined by means of a subnet IP address, and a subnet mask. The IP router will learn only addresses of agent IP addresses, which when viewed through the mask, match the subnet IP address. Therefore, the IP router can be instructed to learn only IP addresses of Kilomux units within predefined subnetworks. In the example, of *Figure C-2*, Kilomux units in network A need only learn the addresses of other units in the same network, and those of units in network B; the same is true for the units in networks C and B.

Each pair of subnet IP address and subnet mask is called a net entry, and is assigned a unique ID. The range of ID's is 1 through 255.

C.4 SNMP Traps

The SNMP agent of the Kilomux supports the MIB-II authentication trap, and in addition generates the following enterprise-specific traps:

- Each alarm message
- The result of each sanity check.

The following commands are used to set the SNMP traps:

- DEF AGENT
- DEF NAME
- DEF MANAGER LIST.

Note *After using DEF AGENT, you must reset Kilomux.*

Note *Identifying a remote agent takes about 1 minute.*

Appendix D
Software Download

D.1 Scope

This section presents procedures for installing new software upgrade releases in the KCL.2 module. The KCL.2 module stores the software in Flash memory. The software is stored in compressed format, and is decompressed and loaded into the module RAM upon power-up. Since the Flash memory is not used to run the software, new software can be loaded in two ways:

- Off-line, using any PC directly connected to the Supervisory Port of the KCL.2 module. In this case, the Kilomux system cannot carry traffic while software downloading takes place. This procedure can be used to upgrade the module software version, as well as to install software in a new KCL.2 module, e.g., a repaired module. This installation method is called *cold*, or *local*, software installation.

  The cold software installation process must be performed from the DOS prompt; only use a DOS window under Windows. The program DL.EXE is required for performing the cold installation.

- On-line, use TFTP software, directly or through other Kilomux systems without stopping the operation of the Kilomux system in which the KCL.2 module is installed.

  This procedure can only be used to upgrade the module software version while the equipment operates, and therefore it is called *warm*, or *remote*, software installation.

Software releases are distributed as a compressed software file, KM2100.ARJ.

D.2 Cold (Local) Installation Procedure

Download Procedure

1. Copy the distribution files, KM2100.ARJ and DL.EXE, to a convenient directory on your PC.
2. Set DIP switch 3 on the KCL.2 back panel to ON.
3. Turn Kilomux on, and wait a few seconds.

4. Set DIP switch 3 on the KCL.2 back panel to OFF, then set it to ON and then back to OFF. This is needed to prevent erasing the KCL.2 software in case you mistakenly turn the power on while DIP switch 3 is set to ON.
5. Wait until the TST LED on the KCL.2 back panel is on and the ALM LED on the KCL.2 back panel is flashing. Now the Flash memory is erased.

Note *If a fault occurs during the erase process, the red ALM indicator turns on. In this case, turn the Kilomux off, and start the procedure again with DIP switch 3 ON.*

6. Connect the serial port of the PC to the Supervisory Port 9-pin connector of the KCL.2 module (designated CONTROL on the panel). Use a standard straight communication cable.
7. Run the DL.EXE program. After the program starts, select the option C, and configure the PC for downloading as follows:
   - Select the option P, and then select the PC serial port, COM1 or COM2, which is connected to the KCL.2 module.
   - Press ESC.
   - Select the option F and type KM2100.ARJ as the file name.
   - Press ESC.
8. Start sending the file by selecting the option S. The software file is sent to the Kilomux. You can monitor the progress of file transmission on the PC as the software is being sent to the Kilomux. The TST LED and the ALM LED of the KCL.2 module is flashing, while data transfer proceeds normally.

Note *If a fault occurs during file sending, the red ALM indicator of the KCL.2 module turns on. In this case, turn the Kilomux off, and start the procedure again with DIP switch 3 ON.*

9. Wait until the sending process has been successfully completed.
10. Quit the DL.EXE program (select the option Q).
11. Turn off Kilomux and set DIP switch 3 on the KCL.2 module to OFF. The new compressed software is loaded into the module Flash.
12. Turn ON Kilomux. The TST indicator flashes during decompression. After the decompression process is completed, the configuration is preserved and the software starts running.

D.3 Warm Installation (Upgrading) Procedure - Windows-Based Stations

You can upgrade the KCL.2 software during run time using a PC or a workstation with a TFTP Client application (there is no need to turn off Kilomux).

Preparations

1. Run Windows.
2. Copy the distribution file, km2100.arj to the desired directory of the PC used as a management station.
3. Make sure the network management station can communicate with the Kilomux.
4. When downloading a remote Kilomux, it is necessary to define the downloading station as a manager on the ASCII terminal using the DEF MANAGER LIST command (refer to the *DEF MANAGER LIST* command in the *Command Set Description* appendix). This command is available with version 2.0 and up.

Downloading Procedure

1. Run the TFTP application.
2. Set the parameter values in the TFTP client software as follows:
   Time-out = 20 sec
   Total Retransmission = 200 sec (if available)
   Host = IP address of Kilomux
   Remote File = km2100.arj
   Local File = Enter full path for the km2100.arj file
   Transfer Mode = Binary
3. When done, press the OK button.
4. The file km2100.arj is now sent to Kilomux. The TFTP window displays the number of bytes already sent. If a fault occurs, the transfer stops before the total number of bytes of the KM2100.ARJ file is transferred and a TIME OUT error message is displayed. The KCL.2 resets after a failed download, so wait at least 2-3 minutes before restarting. Restart by displaying the TRANSFER menu.
5. After the transfer is successfully completed, the KCL.2 module is automatically reset. Due to module resetting, the new software is decompressed and loaded into the module RAM.

Note *The red TST indicator flashes during decompression.*

Appendix E
Configuration Parameters

E.1 General

This appendix lists the various parameters that can be used to configure the Kilomux.

System Configuration Parameters

The following table lists the available system configuration parameters that can be configured from the front panel, and their functions. The table also lists the parameter values included in the Kilomux default configuration. Refer to the *Operation* chapter for information on additional system parameters.

Table E-1. System Parameters

Designation	Function	Values
CLK_MASTER	Selects the master timing reference for the main link transmit path. This parameter is displayed only when the main link interface is DCE or external DCE (E-DCE), which are available only with the KML.1, KML.2, KML.3 KML.4 and KML.F modules using the TE mode. It is not displayed when a KML.5, KML.6, KML.7, KML.8, KML.10 module is installed.	**INT** - Internal oscillator **i:j** - Locked to the external clock received from the indicated data channel. This selection is available only when the Kilomux enclosure includes I/O modules with synchronous data channels which support the DTE2 timing mode, e.g., KLS.1, KHS.1, modules with ISDN interface, e.g., KHS.U or KVF.4/S0, or modules with T1 or E1 interface, e.g., KVF.5. Only channels of such modules are available for selection on the LCD. Note that the selected channel must actually use a timing mode which supports the connection of an external timing reference, e.g., the DTE2 mode for synchronous data channels, the TE or LT mode for ISDN channels, or loopback timing for T1 or E1 interfaces). A is the Kilomux I/O slot number (1 through 12). B is the module channel number, 1 or 2. **Default: INT**

Table E-1. System Parameters (Cont.)

Designation	Function	Values
CLK_FBACK	Selects the alternate (fallback) timing reference for the main link transmit path, to be used in case the master reference fails. This parameter is displayed under the same conditions the CLK_MASTER parameter is displayed. **Note**: If you selected one of the channels as main source, do not select the same channel as fallback source.	**NONE** - No fallback source is used **i:j** - Same selections as for CLK_MASTER **Default: NONE**
DWLD_BW_A DWLD_BW_B	Controls the use of the in-band management channel A Controls the use of the in-band management channel B	**NO** - Disables the in-band management channel **In-band management channel data rate:** 0.8 kbps 1.6 kbps 2.4 kbps 3.2 kbps 4.8 kbps 9.6 kbps 19.2 kbps **Default: NO**
ML_MODE	Controls the main link operating mode	**SINGLE** - single main link operation **REDUND** - the two KML modules operate as a redundant pair **DUAL_LNK** - the two KML modules provide two independent links **PRI_BMP** - the two KML modules provide two parallel links with priority bumping **SW_BACK** - switched backup mode: one of the KML modules provides the main link and the other module provides a switched backup link **SINGLE_SW** - the single main link is in switch mode **DUAL_SW** - the two KML modules are in switch mode **SINGLE&SW** - one KML module is in switch mode, and the other is in single mode **Default: SINGLE**

Table E-1. System Parameters (Cont.)

Designation	Function	Values
ACTIVE_ML	When redundancy is enabled, allows the selection of the active KML module	**AUTO** - Automatic selection of active module **ML-A** - Module KML-A is selected (redundancy switching is overridden) **ML-B** - Module KML-B is selected (redundancy switching is overridden) **Default: AUTO.** In this case, upon power-up, the KML-A module is selected as default if both KML modules are installed and operating normally

Main Link Configuration Parameters

The following table lists the available main link parameters that can be configured from the front panel, and their functions. The table also lists the parameter values included in the Kilomux default configuration.

The available parameters depend on the type of main link module installed in the Kilomux enclosure (for a complete description of all the configuration parameters of main link modules, including the parameters that can be configured only through the supervision port, refer to the corresponding main link module Installation and Operation manual).

Note that when two main link modules of the same type are installed in the Kilomux enclosure, the selected parameter values are used by both KML modules; parameters used by modules serving only for backup may differ.

Table E-2. Main Link Parameters

Designation	Function	Values
SPEED	Determines the main link rate. The supported data rates depend on the main link module type (refer to the corresponding module Installation and Operation Manual).	Data rate in kbps: 9.6, 14.4, 19.2, 28.8, 32, 48, 56, 64, 128, 192, 256, 384, 512, 768, 1024, 1536 **Default: 64**
TIMING	Determines the system-timing mode. For the modules KML.1 through KML.4, also selects the main link interface type.	KML.1, KML.2, KML.3 and KML.4: **DTE** - DTE timing **DCE** - DCE timing **E-DCE** - External DCE timing **Default: DTE** KML.5 and KML.6: **INT** - Internal timing **LBT** - loopback timing KML.7, KML.8 and KML.F: **INT** - Internal timing **LBT** - loopback timing **DCE** - DCE timing KML.11: **INT** - Internal timing **DCE** - DCE timing **Adaptive** timing
BUFFER_SIZE	Determines the size of the main link receive buffer used in the DTE and E-DCE modes (supported by modules KML.1 through KML.6 only). This parameter is not displayed when the main link interface is DCE.	**8** - ±8 bits **256** - ±256 bits, recommended for use on satellite links **Default: 8**
INTERFACE	Displays the physical interface selected by means of an adapter cable for the KML.3 module.	**V.35** - V.35 interface **X.21** - X.21 interface
DSR&CTS	Determines the handling of the DSR and CTS signals for the modules KML.1, KML.2 and KML.3. When these signals are logically OFF, the transmit data line would be held to MARK.	**EXT** - When DSR and/or CTS signals are OFF, the transmit data line is held at MARK. **INT** - The states of the external DSR and/or CTS signals are disregarded; and both signals are assumed to be continuously ON (the transmit data is then not held to MARK when the state of either external line is OFF) **Default: INT**

Table E-2. Main Link Parameters (Cont.)

Designation	Function	Values
I TS CODE	Selects the code transmitted to fill idle (empty) time slots in the frames transmitted on the T1 or E1 line by the KML.7 and KML.8 modules.	The available selections are 00 to FF (hexa) **Default: 00 for the KML.7, 3F for the KML.8**
FRAME	Selects the multiframing mode for the KML.7 and KML.8 modules.	**KML.7 module:** D4(SF) - 12 frames per multiframe ESF - 24 frames per multiframe Default: SF KML.8 module: G732N - 2 frames per multiframe G732S - 16 frames per multiframe Default: G732N
SYNC	Selects the frame synchronization algorithm used by the KML.7 and KML.8 modules, and thus effects the time required to return to normal operation after local loss of synchronization.	**CCITT** - Complies with ITU-T Rec. G.732 (on the KML.8 module only) **62411** - As required by AT&T TR-62411 (after 10 seconds) **FAST** - After 1 second **Default: FAST**
CRC-4	Enables the generation of check bits in accordance with the CRC-4 polynomial specified by ITU-T Rec. G.704 for the frames transmitted on the E1 line, and the checking of the check bits carried by the received E1 frames. This parameter is available only on the KML.8 module.	**NO** - CRC-4 option disabled **YES** - CRC-4 option enabled **Default: NO**
CODE	Selects the line coding method used for zero suppression on the T1 link of the KML.7 module.	**TRAN** - Transparent (AMI) coding, no processing for zero suppression **B7ZS** - B7ZS coding **B8ZS** - B8ZS coding **Note**: Clear channel capability is available only with B8ZS coding. **Default: B8ZS**
FUNCTION	Displays the function of the link interface of the KML.7 and KML.8 modules.	**On KML.7 module only:** **DSU** - The module has a DSU link interface **CSU** - The module has a CSU link interface **On KML.8 module only:** **DSU** - The module has an LTU link interface

Table E-2. Main Link Parameters (Cont.)

Designation	Function	Values
MASK	Controls the transmit signal characteristics of the KML.7 module. The displayed options depend on the link interface hardware (with or without CSU): – When the link interface does not include a CSU, the transmit signal mask can be selected in accordance with the transmit line length, to meet DSX-1 requirements, as specified by AT&T CB-119, or set for compliance with FCC Rules Part 68A. – When the link interface includes a CSU, the transmit signal can be attenuated by 7.5, 15, or 22.5 dB, to meet the requirements of FCC Rules Part 68A.	**For link interfaces without CSU:** The following selections indicate the line length in feet: Length (ft) — Display 0-133 — 000 - 133-266 — 133 - 266-399 — 266 - 399-533 — 399 - 533-655 — 533 - FCC68A — Compliance with FCC Rules Part 68A **Default: 0-133** **For link interfaces with CSU:** **0** - No attenuation **7.5** - Attenuation of 7.5 dB relative to the nominal transmit level **15** - Attenuation of 15 dB relative to the nominal transmit level **22.5** - Attenuation of 22.5 dB relative to the nominal transmit level **Default: 0**
MODE	Selects the operating mode of the KML.10 module.	**SWITCHED** - Operation with ISDN switch **LEASED** - Operation over leased lines **Default: LEASED**
ISDN STANDARD	Selects the service mode for KML.10 modules.	**5ESS_POINT_TO_POINT** - AT&T 4ESS and 5ESS switches, point-to-point service **5ESS_MULTIPOINT** - AT&T 4ESS and 5ESS switches, multipoint service **DMS-100** - Northern Telecom DMS-100 switch **NATIONAL-ISDN1** - Bellcore NI1 switch **EURO_ISDN** - ETSI Euro-ISDN NET3 **NTT_ISDN** - NTT Japanese ISDN implementation **Default: EURO_ISDN**
B CH	Selects the B-channel used by KML.10 modules to carry the user's data when the main link rate is 64 kbps.	**B1** - B1 channel **B2** - B2 channel **Default: B1**

Table E-2. Main Link Parameters (Cont.)

Designation	Function	Values
MAIN LINK IP ADDRESS	Determines the main link IP address.	Four groups of digits ranging from 0 through 255 separated by periods
GATEWAY MAIN LINK IP ADDRESS	Determines the gateway IP address.	Four groups of digits ranging from 0 through 255 separated by periods
SUBNET MASK	Determines the mask.	Four groups of digits ranging from 0 through 255 separated by periods
DESTINATION MAIN LINK IP ADDRESS	Choose a remote main link to work with.	Four groups of digits ranging from 0 through 255 separated by periods
IP TYPE OF SERVICE	Set the IP TOS field in the IP frames transmitted by the device.	0 through FF
IP MUX BUNDLE ID	The bundle identifier. Identical on both sides.	1 through 255
AUTO_NEG	Enable the auto negotiation mode.	**YES** - Work with maximum capability rate **NO** - The rate is determined by the user
LAN_RATE	Sets the port mode (half/full duplex) and rate (10/100 Mbps).	10 Mbps FD 10 Mbps HD 100 Mbps FD 100 Mbps HD N/A - When auto negotiation is set to YES
MAX_CAP	Determine the maximum capabilities of the port for the auto negotiation process (the value can be lower than the actual capability).	10 Mbps FD 10 Mbps HD 100 Mbps FD 100 Mbps HD N/A - When auto negotiation is set to NO
TDM BYTES	The number of TDM bytes to be sent in an Ethernet frame.	48, 96, 144, 192, 240, 288, 336 or 384 bytes
JITTER BUFFER	The size of an elastic buffer per bundle whose size is configurable.	100 through 1000 msec in increments of 100 msec

Supervisory Port Configuration Parameters

Table E-3 lists the available supervisory port configuration parameters that can be configured from the front panel, and their functions. The table also lists the parameter values included in the Kilomux default configuration.

Table E-3. Supervisory Port Parameters

Designation	Function	Values
SPEED	Selects supervisory port data rate	Supervisory port data rate in kbps: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600 **AUTO** - Autobaud operation. The Kilomux automatically identifies the data rate applied to its supervisory port. To enable positive identification, the transmission must start with three consecutive Carriage Returns. Do not select AUTO when connecting to a RADview station. **Default: 9600**
DATA	Selects the number of data bits in the word format	7 or 8 data bits. **Default: 8**
PARITY	Controls the use of parity	**ODD** - Odd parity **EVEN** - Even parity **NONE** - Parity disabled (only with 8 data bits) **Default: NONE**
INTERFACE	Selects supervisory port interface	**DCE** - The Kilomux appears as a DCE for the supervision terminal **DTE** - The Kilomux operates as a DTE, for connection via modem to the supervision terminal. A cross-over cable must be used (Appendix A). **Default: DCE**
CTS	Selects if the CTS line is always active or if it follows the RTS line	**=RTS** **ON** **Default: ON**
DCD_DEL	Indicates time delay between DCD=ON and the sending of data	In msec: 0, 10, 50, 100, 200, 300 **Default: 0 msec**
DSR	Selects if the DSR line is continuously ON or if it tracks the DTR line	**ON** =DTR Default: ON

Table E-3. Supervisory Port Parameters (Cont.)

Designation	Function	Values
POP_ALARM	Controls the automatic display of alarms on the terminal	**NO** YES Default: NO
PWD	Controls password protection	**NO** YES Default: NO
LOG_OFF	Selects idle disconnect time	**NO** 10 MIN: 10 Default: NO
AUXILIARY_ DEVICE	Selects auxiliary device	**NMS_SLIP** AGENT_SLIP TERMINAL Default: TERMINAL

Appendix F
Command Set Description

F.1 General

This appendix describes the Kilomux commands. The commands are listed in alphabetical order. The description includes command format, use, and options.

The following notation conventions are used:

[ ]	square brackets enclose an optional entry/parameter
{ }	braces enclose a list of entries/parameters from which one must be selected
<ENTER>	indicates the pressing of the ENTER key
<SP>	indicates the pressing of the space bar
i	indicates an I/O slot number
OP	indicates the options slot
j	indicates the channel number within the selected I/O slot.

Note *The ML-B option is for Kilomux-2100 only.*

Some commands may include fields not be relevant for Kilomux-2104. For example, the ML-B field in the DSP ST SYS command.

F.2 Commands

The following are the Kilomux commands.

BYE

Purpose

Return control to the Kilomux front panel when TELNET session is terminated.

Format

```
BYE
```

Use

- Type:

  BYE <ENTER>

Note *If this command is not used, you will need to wait 10 minutes to start new TELNET session.*

CLR ALM

Purpose

Clear the alarm buffer.

Format

```
CLR ALM [LOC] [/A]
```

Use

1. To clear only the event alarms on the local Kilomux, type:

   CLR ALM LOC <ENTER> or CLR ALM <ENTER>

   To clear all the alarms on the local Kilomux, type:

   CLR ALM /A <ENTER> or CLR ALM LOC /A <ENTER>

2. After the desired parameter values are selected, press ENTER to end.

   Kilomux will display the time and date, followed by the Kilomux prompt.

CLR LAN STATISTICS

Purpose

Clear the Rx and Tx frame counters.

Format

```
CLR LAN STATISTICS { [ML A] [ML B] }
  or
CLR LAN STAT { [ML A] [ML B] }
```

Use

1. To clear the Rx and Tx frame counters when the main link mode is SINGLE, type:

   `CLR LAN STATISTICS <ENTER>` or `CLR LAN STAT <ENTER>`

2. To clear the counter of ML A or ML B in dual link configuration, type:

   `CLR LAN STATISTICS A <ENTER>` or `CLR LAN STAT A <ENTER>`

   `CLR LAN STATISTICS B <ENTER>` or `CLR LAN STAT B <ENTER>`

CLR LOOP

Purpose

Deactivate the specified user-initiated test or loop. Refer to the *Diagnostics* chapter for a description of the available tests.

Format

```
CLR LOOP [looptype] { [ML A] [ML B] [i:j] }
  or
CLR LP [looptype] { [ML A] [ML B] [i:j] }
```

Use

1. To deactivate a specific type of loop on main link A, type:

```
CLR LOOP L ML A <ENTER>      or   CLR LP L ML A <ENTER>
CLR LOOP R ML A <ENTER>      or   CLR LP R ML A <ENTER>
CLR LOOP V54.2 ML A <ENTER>  or   CLR LP V54.2 ML A <ENTER>
CLR LOOP V54.3 ML A <ENTER>  or   CLR LP V54.3 ML A <ENTER>
CLR LOOP L ML <ENTER>        or   CLR LP L ML <ENTER>
CLR LOOP R ML <ENTER>        or   CLR LP R ML <ENTER>
CLR LOOP V54.2 ML <ENTER>    or   CLR LP V-54.2 ML <ENTER>
CLR LOOP V54.3 ML <ENTER>    or   CLR LP V-54.3 ML <ENTER>
```

Note

For main link A, it is not necessary to specify the link, e.g., you can type
CLR LOOP L ML <ENTER>
instead of
CLR LOOP L ML A <ENTER>.

2. To deactivate a specific type of loop on main link B, type:

```
CLR LOOP L ML B <ENTER>      or   CLR LP L ML B <ENTER>
CLR LOOP R ML B <ENTER>      or   CLR LP R ML B <ENTER>
CLR LOOP V54.2 ML B <ENTER> or   CLR LP V54.2 ML B <ENTER>
CLR LOOP V54.3 ML B <ENTER> or   CLR LP V54.3 ML B <ENTER>
```

3. To deactivate all the loops of a certain main link, type:

For main link A: `CLR LP ML A <ENTER>` or `CLR LOOP ML A <ENTER>`

For main link B: `CLR LP ML B <ENTER>` or `CLR LOOP ML B <ENTER>`

4. To deactivate a specific type of channel loop or test, type:

```
CLR LOOP L i:j <ENTER>         or CLR LP L i:j <ENTER>
CLR LOOP R i:j <ENTER>         or CLR LP R i:j <ENTER>
CLR LOOP PRBS_INJ i:j <ENTER> or CLR LP PRBS_INJ i:j <ENTER> (data channel only)
CLR LOOP TONE_INJ i:j <ENTER> or CLR LP TONE_INJ i:j <ENTER> (voice channel only)
CLR LOOP BERT i:j <ENTER>      or CLR LP BERT i:j <ENTER>      (data channel only)
```

Note *If the desired module is a module for which it is not possible to loops or tests on a specific channel, e.g., a KLS.2 module, type an asterisk * instead of the channel number, B.*

5. To deactivate all the channel loop and tests, type:

`CLR LOOP i:j <ENTER>` or `CLR LP i:j <ENTER>`

Use the asterisk under the conditions explained above.

You will see the time and date, followed by the Kilomux prompt.

CLR MONITOR

Purpose

Deactivate the monitoring of an I/O module channel.

Format

`CLR MONITOR` or `CLR M`

Use

- To deactivate the monitoring of the currently selected I/O channel, type:

`CLR MONITOR <ENTER>` or `CLR M <ENTER>`

You will see the time and date, followed by the Kilomux prompt.

CONNECT SWITCH

Purpose

Dials and connects to the remote Kilomux from the local Kilomux's main link over the ISDN switch line when the following is true:

- The Kilomux's main link is configured to manual operation and switch mode (refer to *DEF ML* command).
- The system is in switch mode (refer to *DEF SYS* command).

The link will be connected until the *DISCONNECT SWITCH* command is activated or until reset. Refer to *DISCONNECT SWITCH* on *page F-32*.

Format

```
CONNECT SWITCH [A] [B]
```

Use

- Type:

```
CONNECT SWITCH A <ENTER>
or
CONNECT SWITCH B <ENTER>
```

Note *Use of this command is dependant on the configuration of the local Kilomux. The main link (A or B) must be attached to a KML.10 card whose parameters (set by the command DEF ML) are:*
- main_link_mode=SWITCH
- switch_mode=MANUAL
and the main link is 'master 'in_num_mode=NONE (set by the command DEF ML CALL).

Note *Before using this command be sure that the calling numbers are initiated (refer to the command DEF ML CALL).*

The link will remain connected until the use of the command DISCONNECT SWITCH or Kilomux is reset.

DATE

Purpose

Set the date for the Kilomux internal real-time clock.

Format

```
DATE
```

Use

1. To set the date, type:

   ```
   DATE <ENTER>
   ```

   Kilomux sends the date entry form:

   ```
   Date
   Day      = 06
   Month    = 06
   Year     = 2000
   ```

2. Bring the cursor to the first field to be changed by pressing ENTER.
3. To change the selected field, press F to increase and B to decrease the displayed value.

   When done, press ENTER to move to the next field.
4. To end, press ENTER after the YEAR field.

   Kilomux will display the time and date fields (note that the date has changed), followed by the Kilomux prompt. The day of the week is automatically stamped.

DEF AGENDA

Purpose

Define the daily schedule of utilization of the switched backup mode. Separate schedules can be defined for each day of week. Each 24-hour schedule includes up to four independent periods, defined by the starting and ending time (hour and minutes). For each period, you can enable or disable the use of a switched backup link.

Format

```
DEF AGENDA [day]
```

where

`day` stands for SUN, MON, TUE, WED, THU, FRI or SAT.

Use

1. To select the schedule for a specific day, e.g., for Sunday, type:

   ```
   DEF AGENDA SUN <ENTER>
   ```

The first part of the daily schedule parameters data form is displayed. A typical data form is shown below:

```
[——Zone 1——] [——Zone 2——] [——Zone 3——] [——Zone 4——]
START    END/START    END/START    END/START    END
00:00      hh:mm        hh:mm        hh:mm      24:00
```

where**:**
`hh` **-** hour (00 through 23)
`mm` **-** minutes (00 through 59)

2. Change parameters as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - Change the selected field by pressing F or B to scroll among the available selections. When the desired selection is displayed, press the space bar to move to the next field.
3. After the desired parameter values are selected, press ENTER to end.

   Kilomux will display the time and date fields, followed by the Kilomux prompt.
4. After the last change, press ENTER.

   The second line of the data form, used to control the use of the switched backup link, is displayed:

```
[——Zone 1——] [——Zone 2——] [——Zone 3——] [——Zone 4——]
START    END/START    END/START    END/START    END
00:00      hh:mm        hh:mm        hh:mm      24:00
BACKUP:     YES          YES           NO        YES
```

5. Use the procedure described above to select the desired value for each period:
   - **YES** - The use of the switched backup link is allowed.
   - **NO** - The use of the switched backup link is not allowed.
6. After the desired parameter values are selected, press ENTER to end.

   Kilomux will display the time and date fields, followed by the Kilomux prompt.

DEF AGENT

Purpose

Display and modify the current SNMP agent parameters.

Note

To enable SNMP and TELNET management, it is necessary to define all the parameters.

Format

```
DEF AGENT
```

Use

1. Type:

   ```
   DEF AGENT <ENTER>
   ```

   Kilomux displays the following SNMP data form:

   ```
   OLD AGENT PARAMETERS

   --------------------

   IP ADDRESS IS            : = XXX.XXX.XXX.XXX
   SUBNET MASK IS           : = XXX.XXX.XXX.XXX
   DEFAULT GATEWAY IS       : = XXX.XXX.XXX.XXX
   READ COMMUNITY IS        : = public
   WRITE COMMUNITY IS       : = private
   TRAP COMMUNITY IS        : = public

   TELNET_APATHY_TIME       10 MIN
   IP_ADDRESS               999.999.999.999
   SUBNET MASK              999.999.999.999
   DEFAULT GATEWAY          999.999.999.999
   SNMP READ COMMUNITY
   SNMP WRITE COMMUNITY
   SNMP TRAP COMMUNITY
   ```

   where X stands for the digits of the current IP address, Subnet Mask and Default Gateway.

2. Change a parameter by placing the cursor on the desired field, delete the current value, and type the new value. The only exception is TELNET_APATHY_TIME, which is selected by pressing the F or B keys. Remember that community names are case-sensitive.

3. Continue until all the parameters are defined, and then press ENTER to end.

   A typical display, as seen after all the parameters are selected, is shown below:

   ```
   CURRENT AGENT PARAMETERS

   --------------------

   IP ADDRESS IS            : = XXX.XXX.XXX.XXX
   SUBNET MASK IS           : = XXX.XXX.XXX.XXX
   DEFAULT GATEWAY IS       : = XXX.XXX.XXX.XXX
   READ COMMUNITY IS        : = public
   WRITE COMMUNITY IS       : = private
   TRAP COMMUNITY IS        : = public
   ```

   where X stands for the digits for the current IP address, Subnet Mask and Default Gateway.

The agent parameters displayed on the data form, and their range of values, are as follows:

- **TELNET_APATHY_TIME** - Press the F or B key to select the time (in minutes) after which a TELNET connection will automatically be terminated if no incoming activity is detected. The available values are 10MIN, 15MIN and 20MIN.

- **IP_ADDRESS** - Type the IP address assigned to the SNMP agent in the dotted-quad form (four groups of digits ranging 0 through 255, separated by periods).
- **SUBNET MASK** - Type in the subnet mask in the dotted-quad format. The mask consists of four groups of digits in the range of 1 through 255, separated by periods. The net section must consist of 1's.
- **DEFAULT GATEWAY** - Type in the IP address assigned to the DXC SNMP agent in the dotted-quad format (four groups of digits in the range of 0 through 255, separated by periods).
- **READ COMMUNITY** - Type the name of the SNMP community that has read-only authorization. The SNMP agent will accept only `getRequest` and `getNextRequest` commands from management stations using that community. You may enter up to seven alphanumeric characters.
- **WRITE COMMUNITY** - Type the name of the SNMP community that has read-write authorization. The SNMP agent will also accept `getRequest` commands from management stations using that community. You may enter up to seven alphanumeric characters.
- **TRAP COMMUNITY** - Type the name of the SNMP community to which the SNMP agent will send traps. You may enter up to seven alphanumeric characters.

DEF ALM DEBOUNCE

Purpose

Define the debounce time (in seconds) for each alarm code, or mask the alarm. The debounce time is the amount of time allowed for the alarm code to settle into the "on" state. If the alarm reaches the "on" state during the debounce time, the alarm string with the debounce number is reported to the user.

Format

```
DEF ALM DEBOUNCE
```

Use

1. Type:

   DEF ALM DEBOUNCE

   Kilomux displays the following:

   ```
   ALARM NUMBER (1 to 102) =
   ```

2. Enter the number of alarm codes you want to change and press ENTER.

   Kilomux displays the following:

   ```
   ALARM DEBOUNCE (0 to 255) =
   ```

3. Enter the debounce number. The debounce number can be one of the following:

0 - Default of debounce, e.g. after initiate database
255 - Mask the alarm and do not report to the user
1 to 254 - Debounce (in seconds).

4. Press ENTER.

   The alarm string with debounce number will display.

DEF CALL

Purpose

Define the call-out parameters for the Kilomux dial-out port (connector CONTROL-DTE). The call-out function is enabled by means of the DEF DP port.

The specified call-out parameters are used by Kilomux to build the call command that is sent to the dial-out modem. The modem connected to the CONTROL-DTE connector must be set up as follows (for convenience, the Hayes commands required to select the specified parameters are listed in brackets):

- Auto-answer mode (`AT S0=1`)
- Call set up in response to the `CONNECT` string (`AT X0`)
- No echo (`AT E0`)
- Verbose mode (no codes, e.g., `CONNECT` string instead of `0`) (`AT V1`).

Format

```
DEF CALL
```

Use

1. To define the Kilomux call-out parameters, type:

   ```
   DEF CALL <ENTER>
   ```

   You will see the first page of the call-out parameters data form. A typical display is shown below.

```
NUM_OF_RETRIES  WAIT_FOR_CONNECT  DIAL_MODE  ALT_NUM_MODE
     0              60SEC           TONE       NO
```

2. Change the parameter values as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections.
   - When the desired selection is displayed, press the space bar to move to the next field.

   The call-out parameters are displayed on the first page of the data form. Call-out parameters, their functions and their range of values, are shown in *Table F-1*.

Table F-1. Call-out Parameters

Designation	Function	Values
NUM_OF_RETRIES	Controls the number of dialing tries, and applies to both the primary and the alternate numbers. • If the call is not established after dialing the primary directory number the specified number of times, Kilomux attempts to establish the call by dialing the alternate directory number (provided the use of an alternate number is enabled by means of the ALT_NUM_MODE parameter). • If the call cannot be established within the specified number of redialing attempts on neither of the two directory numbers, Kilomux stops the call attempts. When a new alarm report must be sent, the call attempts are started again. The user is notified that the call attempts failed by a message recorded in the alarm buffer (separate messages are provided for each directory number).	0 - no redialing attempts are made in case the call is not established on the first attempt. 1 through 8 - in case the call is not established on the first attempt, Kilomux will redial the specified number of times.
WAIT_FOR_CONNECT	Specifies the time Kilomux will wait for an answer after each dialing attempt. If the called station does not answer within the specified time, Kilomux disconnects. If additional call attempts are allowed, Kilomux will redial immediately after disconnecting.	30, 45 or 60 seconds
DIAL_MODE	Selects the dialing mode. The appropriate dialing mode depends on the dialing mode supported by the telephone network.	**TONE** - The modem is instructed to use DTMF dialing. **PULSE** - The modem is instructed to use pulse dialing.
ALT_NUM_MODE	This parameter is used to control the use of an alternate number. The alternate number is dialed used after the specified number of call attempts on the primary number failed.	**NO** - no alternate number. In this case, Kilomux stops the call attempts after the specified number of call attempts on the primary number failed. **YES** - The use of an alternate number is enabled.

3. When done, press ENTER.

   The second page of the call-out parameters data form is displayed. A typical display is shown below:

```
NEW PRIMARY NUMBER [MAX 20 CHARS] =
CURRENT PRIMARY NUMBER            = 'primary number'
```

   The second page is used to enter a new primary directory number, and the second row displays the current primary directory number. The directory number can include up to 20 digits, including the * and # symbols.

4. After entering the desired directory number, press ENTER:
   - If the ALT_NUM_MODE parameter is NO (no alternate number), Kilomux will display the TIME and DATE fields, followed by the Kilomux prompt.
   - If the ALT_NUM_MODE parameter is YES, you will see the third page of the call-out parameters data form, used to enter a new alternate directory number. A typical display is shown below.

```
NEW ALTERNATE NUMBER [MAX 20 CHARS] =
CURRENT ALTERNATE NUMBER           = 'alternate number'
```

5. After entering the desired directory number, press ENTER to end.

DEF CH

Purpose

Define the configuration parameters of a module or module channel. Refer to the relevant module Installation and Operation Manual for a complete listing of the available parameters, and for typical channel parameter data forms for each module.

Format

```
DEF CH {[i:j] [i:*]}
```

Use

1. To define the parameters of a specific module channel, type:

   `DEF CH i:j <ENTER>`

   where `i` is either OP (to select the options slot) or a number in the range of 1 through 12, and `j` depends on the number of configurable channels of the module installed in the specified slot.

2. To define the parameters of all the module channels, type:

   `DEF CH i:* <ENTER>`

   The data form of the selected module or module channel is displayed. The form presents the current parameter values as defaults.

3. Change the parameters as follows:

- Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
- To change the selected field, press F or B to scroll among the available selections. When the desired selection is displayed, press the space bar to move to the next field.

4. After the desired parameter values are selected, press ENTER to end.

   Kilomux displays the time and date fields, followed by the Kilomux prompt.

DEF CON

Purpose

Define the main link to be used by each I/O module.

The command is relevant only for dual-link configurations and switch mode. When using the priority bumping or switched backup mode, this command is also used to define the priority of each module.

Format

```
DEF CON
```

Use

1. Type:

   ```
   DEF CON <ENTER>
   ```

   The main link selection screen is displayed. The screen lists the I/O slots (including the options slot) and the main link currently used by each I/O slot. A typical display is shown below:

   KM2100.def con

```
I/O          GROUP       OPERATED_HIGHWAY       PB[A->B]   PB[B->A]    SWITCH
================================================================================
OP           ALL         ML-A                   N/A        N/A         N/A
1            ALL         ML-B                   N/A        N/A         N/A
2            ALL         ML-A                   N/A        N/A         N/A
3            ALL         ML-A                   N/A        N/A         N/A
4            ALL         ML-B                   N/A        N/A         N/A
5            ALL         ML-B                   N/A        N/A         N/A
6            ALL         ML-A                   N/A        N/A         N/A
7            ALL         ML-A                   N/A        N/A         N/A
8            ALL         ML-A                   N/A        N/A         N/A
9            ALL         ML-A                   N/A        N/A         N/A
10           ALL         ML-A                   N/A        N/A         N/A
11           ALL         ML-A                   N/A        N/A         N/A
12           ALL         ML-A                   N/A        N/A         N/A
Checking Frame Structure…
Updating Frame Structure…
```

2. Use the space bar to move the cursor to the desired slot number, and press the F or B key to change the main link used by this I/O slot.

If priority bumping is used, the third row shows the priority assigned to each module when a flip occurs from main link A to main link B.
If priority bumping and switched backup are disabled, this row shows N/A for all the I/O slots.

3. Use the space bar and the F and B keys to change the priorities as necessary.

   A fourth row appears, showing the priorities for flips from main link B to main link A.

   - If the two main links operate at the same data rate or the switched backup mode is used, Kilomux-2100 automatically sets the same priorities for flips in either direction. Then this line shows N/A for all the I/O slots.
   - If the data rates of the two main links are different and the priority bumping mode is used, you can select the priorities for each I/O slot using the same procedure as above.

4. Use the space bar and the F and B keys to change the priorities as necessary.

   A fifth row appears, showing the priorities for automatic switch mode calling with the KML.10 card.

   - The HIGH priority enables Kilomux to make the I/O connection over the ISDN link.
     - The I/O card must be one of the cards that can trigger the connection and must be set as follows:
       - The system mode is SWITCH
       - The main link mode is SWITCH
       - Switch_mode is AUTO.

5. When the desired selections are obtained for all the I/O slots, press ENTER.

Note

If system mode is not SWITCH, the SWITCH line show N/A for all the I/O slots.

DEF DB FLIP

Purpose

Define the times of day (hour and minutes) for switching from one database to the other, or cancel this function.

This command can be used only when an alternate database has already been defined.

Format

```
DEF DB FLIP
```

Use

1. Type:

   ```
   DEF DB FLIP <ENTER>
   ```

The first line of the database flip time definition screen is displayed. A typical display is shown below:

```
                                HH:MM
FLIP TIME TO DATABASE 1 :       00:00
```

where:

- HH – the desired flipping hour (00 through 23), or NA to disable the switching
- MM – the desired flipping minute (00 through 59), or NA to disable the switching.

2. Change parameters as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections. When the desired selection is displayed, press the space bar to move to the next field.
3. After the desired parameter values are selected, press ENTER

   The second line of the database flip time definition screen is displayed:

```
                                HH:MM
FLIP TIME TO DATABASE 2 :       00:00
```

4. Define the second flipping time.

Note

To disable the switching between the two databases, select NA for all the four fields. You should always select NA if the switched backup database is ALTERNATE (see DEF ML CALL command).

5. After the desired values are selected, press ENTER key to end.

   Kilomux displays the time and date fields, followed by the Kilomux prompt.

DEF DP

Purpose

Define the communication parameters of the dial-out port.

The communication parameters depend on the KCL.2 module version:

- For KCL.2 modules with RS-232 interfaces, this command is used to define the communication parameters of the dial-out port, select its operating mode (network management access port or dial-out), and when applicable, control the use of the call-out function. The communication parameters of the dial-out port can be different from the communication parameters of the CONTROL port, which are selected by means of the *DEF SP* command.
- For KCL.2 modules with Ethernet interfaces, there is only the ROUTING_PROTOCOL field.

Format

```
DEF DP
```

Use

1. Type:

   ```
   DEF DP <ENTER>
   ```

   If the KCL.2 module has an Ethernet interface, the following is displayed:

   ```
   ROUTING_PROTOCOL
   NONE
   ```

   where NONE is the default value.

   If the KCL.2 module has RS-232 interfaces, the following is displayed:

   ```
   SPEED      DATA      PARITY     CALL_OUT_MODE
   9600       8         NONE       NO
   ```

   where the parameter values are the default values.

2. Change the parameter values as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections.
   - When the desired selection is displayed, press the space bar to move to the next field.

- When done, press ENTER.

  The second line of parameters is displayed. The following is a typical display:

  ```
  LOG_OFF    AUXILIARY_DEVICE       ROUTING_PROTOCOL
  NO         NMS_SLIP               NONE
  ```

Table F-2 shows the dial-out parameters and their values.

Table F-2. Dial-out Parameters

Designation	Function	Values
SPEED	Selects the dial-out port data rate.	300, 1200, 2400, 4800, 9600, 19200, 38400 and 57600 bps
DATA	Selects the number of data bits in the dial-out port word format:	7 or 8 data bits
PARITY	Controls the use of parity.	**ODD** - Odd parity **EVEN** - Even parity **NO** - Parity disabled (only available with 8 data bits).
CALL_OUT_MODE	Controls the use of the call-out function:	**NO** - Call-out function is disabled. **YES** - Kilomux will initiate a call after each new alarm.
LOG-OFF	Control the idle disconnect time.	**NO** - Automatic session disconnect disabled. **10_min** - Automatic disconnection after 10 minutes, if no input data is received by the dial-out port.
AUXILIARY DEVICE	Selects the management mode supported by the dial-out port: **Note:** At any time, only one of the two ports of the KCL.2 module can be used for management access.	**NMS SLIP** - The dial-out port connects to an SNMP management station and/or TELNET host using the SLIP protocol. **AGENT SLIP** - The dial-out port is connected to another agent port using the SLIP protocol. **NMS PPP** - Same as NMS SLIP, except the PPP protocol is used. **AGENT PPP** - Same as AGENT SLIP, except the PPP protocol is used.
ROUTING PROTOCOL	Controls the transmission of routing tables which allows management traffic to be routed through the dial-out port:	**NONE** - Routing not supported. **PROPRIET** - Routing of management traffic by means of the RAD proprietary protocol.

DEF FRAME

Purpose

Define manually the allocation of bits in the main link frame. This activity is necessary when a KDI module is used to bypass data between the Kilomux main links.

Manual allocation is enabled by means of the *DEF SYS* command.

The *DEF FRAME* command must be repeated after each change in the main link data rate, and/or in the data rate of Kilomux channels.

Format

```
DEF FRAME
```

Use

1. To perform manual bit allocation on the desired main link, type:

   `DEF FRAME A <ENTER>` or `DEF FRAME B <ENTER>`

   A typical DEF FRAME screen is shown below.

```
SLOT    OPERATED_HIGHWAY     SIZE    DATA START
001     ML-A                 013     000
006     ML-A                 012     014
```

   The screen displays the current main link used by each module (in ascending order of slot numbers) and number of main link bits required for each module. The screen fields are as follows:

   - **OPERATED_HIGHWAY** - Displays the main link on which the module installed in the corresponding slot is allocated bandwidth (this parameter is selected by means of the *DEF CON* command).
   - **SIZE** - Displays the total number of bits assigned to the module installed in the corresponding slot (this parameter is determined by the parameters selected for the corresponding by means of the *DEF CH* command).
   - **DATA_START** - Displays the number of the first bit in the block of bits assigned to the module installed in the corresponding slot.

2. You can change the order in which modules are assigned blocks of bits on the main link. To perform the change, bring the cursor to the desired field and then scroll using the F and B keys to display the desired number.

Note *Appendix B in the Installation and Operation Manual of the KDI module contains planning forms to help you in the allocation task.*

3. When the allocation is completed, press ENTER.

   The supervision terminal will display the time and date fields, followed by the Kilomux prompt.

4. To verify the allocation, use the *DSP ST FRAME* command.

DEF MANAGER LIST

Purpose

Define or modify the network management stations to which the SNMP agent of Kilomux sends traps. You can define up to five managers. Each network management station is defined by entering its IP address and the corresponding subnet mask.

Format

```
DEF MANAGER LIST
```

Use

1. To define a management station, type:

   ```
   DEF MANAGER LIST <ENTER>
   ```

   The first line of the managers list data form appears. This is used to define the IP address of the first management station.

2. Type in the IP address of the desired management station. Use the dotted-quad format (four groups of digits ranging from 1 through 255, separated by periods).
3. After filling in the required address, press ENTER.

   The next line is displayed.

4. Type in the subnet mask in the dotted-quad format. The mask consists of four groups of digits ranging from 1 through 255, separated by periods. The net section must consist of 1's.

   After defining the first management station, a typical data form appears as:

   ```
   IP ADDRESS 1 IS     :=  999.999.999.999
   SUBNET MASK 1 IS    :=  999.999.999.999
   ```

5. Press ENTER to proceed to the next lines.
6. Repeat the above procedure to define additional management stations (2 through 10).

   The current list in the following format appears:

   ```
   CURRENT MANAGERS LIST PARAMETERS
   -------------------------------
   IP ADDRESS 1 IS     :=  999.999.999.999
   SUBNET MASK 1 IS    :=  999.999.999.999
   IP ADDRESS 2 IS     :=  999.999.999.999
   SUBNET MASK 2 IS    :=  999.999.999.999
   IP ADDRESS 3 IS     :=  999.999.999.999
   SUBNET MASK 3 IS    :=  999.999.999.999
   .
   .
   .
   IP ADDRESS 10 IS    :=  999.999.999.999
   SUBNET MASK 10 IS   :=  999.999.999.999
   ```

DEF ML

Purpose

Define main link parameters. The applicable parameters depend on the type of main link module and on the main link mode. Refer to the relevant module Installation and Operation Manual for a complete listing of the available parameters, and for typical parameter data forms for each type of main link module.

Format

```
DEF ML [A] [B]
```

Use

1. If the main link mode is SINGLE, type:

   ```
   DEF ML <ENTER>
   ```

   This command defines the parameters of the installed module, irrespective of the enclosure slot in which it is located (slot 3 for main link A, or slot 4 for main link B).

2. To define the parameters of main link A in a dual-link configuration, type:

   ```
   DEF ML <ENTER>
   ```
   or
   ```
   DEF ML A <ENTER>
   ```

3. To define the parameters of main link B in a dual-link configuration, type:

   ```
   DEF ML B <ENTER>
   ```

   The corresponding main link parameters data form is displayed.

4. Make the desired changes, and after the desired parameter values are selected, press ENTER to end.

   Kilomux displays the time and date fields, followed by the Kilomux prompt.

DEF ML CALL

Purpose

Define the parameters used to control the setup of a backup dial-up connection when Kilomux operates in the switched backup mode. The switched backup mode is selected by means of the *DEF SYS* command.

Before using this command, define the configuration parameters of the two main link modules using the *DEF ML* command.

Format

```
DEF ML CALL [A] [B]
```

Use

1. Type the command corresponding to the KML.10 module installed in slot 3 or slot 4:

   ```
   DEF ML CALL <ENTER>
   ```

   The main link call parameters data form is displayed. The data form depends on the type of main link module installed in slot 3 or slot 4, the KML.10 ISDN interface module, or other type of module.

Data Form for KML.10 Modules

A typical US ISDN standard form is shown below:

```
IN_NUM_MODE       CALL_TIME_OUT         SW_BACKUP_DB
NONE              45sec                 ONLINE

ABSTRACT TERMINAL #1
====================
SUB ADDRESS......:
DIRECTORY NUMBER.:
SPID.............:
TEI NUMBER.......:

ABSTRACT TERMINAL #2
====================
SUB ADDRESS......:
DIRECTORY NUMBER.:
SPID.............:
TEI NUMBER.......:

FIRST BACKUP SUB ADDRESS [------]
FIRST BACKUP DIRECTORY NUMBER [----------------]

SECOND BACKUP SUB ADDRESS [------]
FIRST BACKUP DIRECTORY NUMBER [----------------]
```

Note *TEI NUMBER only exists if the TEI MANAGER parameter is set to Static TEI in the DEF ML B command.*

A typical form of other standards (not US ISDN standard) is shown below:

```
IN_NUM_MODE         CALL_TIME_OUT         SW_BACKUP_DB
NONE                45sec                 ONLINE

LOCAL SUB ADDRESS [------]

LOCAL DIRECTORY NUMBER [--------------------]


BACKUP SUB ADDRESS [------]

BACKUP DIRECTORY NUMBER [----------------]
```

2. Select the parameter values as follows:

- **IN_NUM_MODE** - Controls the handling of incoming calls.
  - For the Kilomux unit configured as master, always select **NONE**, to cause the KML.10 module to reject all incoming calls (the master unit need only initiate calls).
  - For the Kilomux unit configured as slave, you can select **ALL**, to cause the KML.10 module to accept incoming calls from all the source addresses, or **LOCAL**, to cause the KML.10 module to accept calls only from the address specified in the **BACKUP_CALL_NUMBER** field.
- **CALL TIME OUT** - Specifies the maximum time Kilomux will wait for the connection of the switched backup link.

If this time expires, Kilomux aborts the connection attempt, and generates alarm message 22. The available selections are 30, 45, 60, and 120 seconds.

- **SW_BACKUP_DB** - Selects the database that will be used to determine the configuration of the backup link when the switched backup mode is used.
  - **ONLINE** - The currently active (on-line) database. The channels to be carried by the backup link must be assigned HIGH priority, using the *DEF CON* command.
  - **ALTERNATE** - When switching to the backup link, Kilomux-2100 automatically switches to the alternate database. For this mode, the alternate database is dedicated only to backup configuration, and must not be used for other purposes (refer to *DEF DB FLIP* command). The channels to be carried by the backup link must be assigned HIGH priority in the background database, using the *DEF CON* command. Also, the *DEF SYS*, *DEF ML B*, and *DEF ML* commands need to be configured in the background database. After the main link returns to normal operation and the backup link is disconnected, Kilomux-2100 automatically returns to the main database.
- **SUB ADDRESS** - Enter the sub address of the local ISDN directory number.
- **DIRECTORY NUMBER** - Enter the ISDN directory number of the line connected to the KML.10 module (up to 20 digits).
- **SPID** - The Service Profile ID. This field is only relevant for US standard.
  - **ATT/5ESS** - AT&T 4ESS and 5ESS switches
  - **NT/DMS-100** - Northern Telecom DMS-100 switch
  - **NI1** - Bellcore National - ISDN1.

  The ISDN service provider provides the SPID number when you subscribe. The SPID number represents the type of service provided. The SPID number is used by the TE interface registration before any calls are established.
- **TEI NUMBER** - Enter the TEI number (0-63). This parameter is only relevant for Static TEI Management.

Note

KML.10 only supports basic data 64K unrestricted service.

- **BACKUP SUB ADDRESS and BACKUP DIRECTORY NUMBER** - Up to two numbers that can be used for backup in master configuration, or for Calling Line Identification (CLI) in slave configuration. Type the numbers in the appropriate field, and press ENTER. To erase a number, type a minus sign (-) before the first digit, and press ENTER.
  - For master configuration - 64K call: Use only the `FIRST BACKUP SUB ADDRESS` and `BACKUP DIRECTORY NUMBER` as the called number.
  - For master configuration - 128K call: If both 64K calls are for the same number (as in the ETSI standard) use only the `FIRST BACKUP SUB ADDRESS` and `FIRST BACKUP DIRECTORY NUMBER`. For the US standard, if the called number is composed of two abstract terminals, enter the first called number in the `FIRST BACKUP SUB ADDRESS`

and FIRST BACKUP DIRECTORY NUMBER and the second in the SECOND BACKUP SUB ADDRESS and SECOND BACKUP DIRECTORY NUMBER.

- For slave configuration - 64K call: Use only the FIRST BACKUP SUB ADDRESS and FIRST BACKUP DIRECTORY NUMBER as the calling number (i.e., the number from which a call is expected).
- For slave configuration - 128K calls: If both 64K calls are expected from a remote KML.10 which is configured with one directory number (as in the ETSI standard) or has one abstract terminal, use only the FIRST BACKUP SUB ADDRESS and FIRST BACKUP DIRECTORY NUMBER.
- For the US standard, if the calling number is composed of two abstract terminals, enter the first expected number in the FIRST BACKUP SUB ADDRESS and FIRST BACKUP DIRECTORY NUMBER and the second in the SECOND BACKUP SUB ADDRESS and SECOND BACKUP DIRECTORY NUMBER.

3. After the desired selections are made, press ENTER to end.

   The supervision terminal displays the time and date fields, followed by the Kilomux-2100 prompt.

Data Form for Other Module Types

A typical data form for a main module (which is not a KML.10 module) is shown below:

```
BACKUP_MODE      CALL_TIME_OUT      SW_BACKUP_DB
PSTN             60 sec             ONLINE
```

The display fields are as follows:

- **BACKUP_MODE** - Defines the type of switched channel:
  - **PSTN** - Public switched telephone network. In this mode, Kilomux-2100 assumes that analog modems are used.
  - **ISDN** - Integrated Services Digital Network. In this mode, Kilomux-2100 assumes direct connection to a B channel of a basic rate ISDN line, using an external NTU device.
- **CALL TIME OUT** - Specifies the maximum time Kilomux-2100 will wait for the connection of the switched backup link. If this time expires, Kilomux-2100 aborts the connection attempt, and generates alarm message 22. The available selections are 30, 45, 60, and 120 seconds.
- **SW_BACKUP_DB** - Selects the database that will be used to determine the configuration of the backup link when the switched backup mode is used. Refer to the section dealing with the KML.10 module for a description of this parameter.

DEF NAME

Purpose

Define the Kilomux node name (up to eight alphanumeric characters).

Format

```
DEF NAME
```

Use

4. To define the Kilomux node name, type:

   ```
   DEF NAME <ENTER>
   ```

   Kilomux displays the node name entry form:

   ```
   ENTER NODE NAME (MAX 8 CHARACTERS)=
   CURRENT NODE NAME = 'name'
   ```

5. Type the desired node name, and then press ENTER.

   The name appears on the second line.

DEF NODE

Purpose

Define the node number of the Kilomux. The allowable range of node numbers is 0 through 255.

Format

```
DEF NODE
```

Use

1. To define the Kilomux node number, type:

   ```
   DEF NODE <ENTER>
   ```

   Kilomux displays the node entry form:

   ```
   NODE (0 to 255) = 0
   ```

2. Type the desired node number, and then press ENTER.

Note *Before entering a node number, make sure that the PSWRD switch located on the Kilomux main board is not set to ON, because in such a case the node number is forced to 0.*

DEF NP

Purpose

Define the configuration parameters of the network port.

The configuration parameters depend on the KCL.2 module version:

- For KCL.2 modules with RS-232 interfaces, this command is used to define the communication parameters of the network port, select its operating mode (network management access port or dial-out), and when applicable, control the use of the call-out function. The communication parameters of the network port can be different from the communication parameters of the CONTROL port, which are selected by means of the *DEF SP* command.
- For KCL.2 modules with Ethernet interfaces, there is only the `ROUTING_PROTOCOL` field.

Format

```
DEF NP
```

Use

1. Type:

   ```
   DEF NP <ENTER>
   ```

   If the KCL.2 module has an Ethernet interface, the following is displayed:

   ```
   ROUTING_PROTOCOL
   NONE
   ```

   where NONE is the default value.

   If the KCL.2 module has RS-232 interfaces, the following is displayed:

   ```
   SPEED      DATA      PARITY     CALL_OUT_MODE
   9600       8         NONE       NO
   ```

   where the parameter values are the default values.

2. Change the parameter values as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections.
   - When the desired selection is displayed, press the space bar to move to the next field.
3. When done, press ENTER.

   The second line of parameters is displayed. The following is a typical display:

   ```
   LOG_OFF    AUXILIARY_DEVICE       ROUTING_PROTOCOL
   NO         NMS_SLIP               NONE
   ```

   The network parameters and their values are listed in *Table F-3*:

Table F-3. Network Parameters

Designation	Function	Values
SPEED	Selects the network port data rate.	The available values are 9600, 19200 38400 and 57600 bps.
DATA	Selects the number of data bits in the network port word format:	7 or 8 data bits
PARITY	Controls the use of parity:	**ODD** - Odd parity E**VEN** - Even parity **NO** - Parity disabled (only available with 8 data bits).
CALL_OUT_MODE	Controls the use of the call-out function: ***Note:*** If the network port interface is configured as DCE, this field displays NO to indicate that the call-out function is disabled.	**NO** - Call-out function is disabled. Y**ES** - Kilomux will initiate a call after each new alarm.
LOG-OFF	Controls the idle disconnect time.	**NO** - Automatic session disconnect disabled. **10_min** - Automatic disconnection after 10 minutes, if no input data is received by the network port.
AUXILIARY DEVICE	Selects the management mode supported by the network port: ***Note:*** At any time, only one of the two ports of the KCL.2 module can be used for management access.	**NMS_SLIP** - the network port connects to an SNMP management station and/or TELNET host using the SLIP protocol. **AGENT_SLIP** - The network port is connected to another agent port using the SLIP protocol. **NMS_PPP** - Same as NMS_SLIP, except the PPP protocol is used. **AGENT_PPP** - Same as AGENT_SLIP, except the PPP protocol is used.
ROUTING PROTOCOL	Controls the transmission of routing tables which allows management traffic to be routed through the network port:	**NONE** - Routing not supported. **PROPRIET** - Routing of management traffic by means of the RAD proprietary protocol.

DEF PWD

Purpose

Define the user password (remember that the user password can only be used when the PSWRD switch located on the KCL module is set to OFF).

Format

```
DEF PWD
```

Use

1. To define the user password, type:

```
DEF PWD <ENTER>
```

The password entry screen appears, e.g.,

```
NEW PASSWORD (4 to 8 CHARS) =
CURRENT PASSWORD = 'password'
```

2. Type the required password (spaces are recognized as valid characters in a password).

   The password appears on the second line.

3. Carefully check that the specified password has been indeed typed in, and then press ENTER.

   The new password takes effect, and the Kilomux prompt reappears.

DEF ROUTE

Purpose

Enables static routing of management information to network devices that do not support the proprietary RIP routing protocol used by the Kilomux. The IP addresses of such devices should be defined here.

By using this command you can declare an IP address on the list as an Ethernet address. When an agent searches for this IP address, it will be directed to the Ethernet.

Format

DEF ROUTE

Use

- Type:

  ```
  Def route <ENTER>
  ```

  The Kilomux displays the following data form:

```
KM2100>def route
CURRENT ROUTE PARAMETERS
------------------------
ROUTE IP ADDRESS          1       IS                  :000.000.000.000
ROUTE IP ADDRESS          2       IS                  :000.000.000.000
ROUTE IP ADDRESS          3       IS                  :000.000.000.000
ROUTE IP ADDRESS          4       IS                  :000.000.000.000
ROUTE IP ADDRESS          5       IS                  :000.000.000.000
ROUTE IP ADDRESS          6       IS                  :000.000.000.000
ROUTE IP ADDRESS          7       IS                  :000.000.000.000
ROUTE IP ADDRESS          8       IS                  :000.000.000.000
ROUTE IP ADDRESS          9       IS                  :000.000.000.000
ROUTE IP ADDRESS          10      IS                  :000.000.000.000

ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
ROUTE IP ADDRESS                  :999.999.999.999
```

DEF SP

Purpose

Assign values to supervisory port parameters. See section *Supervisory Port Configuration Parameters* in Appendix E for parameter description and allowable ranges, and section *Configuring the SP Parameters* in Chapter 3 for practical selection recommendations.

Format

```
DEF SP
```

Use

1. Type

   ```
   DEF SP <ENTER>
   ```

   The supervisory port parameters data form is displayed. The data form lists the parameters on two separate lines. A typical complete form is shown below. The form presents the current parameter values as defaults.

```
SPEED      DATA     PARITY    INTERFACE   CTS     DCD_DEL    DSR
9.6 kbps   8        NONE      DCE         ON      10         ON

POP_ALM    PWD      LOG_OFF   AUXILIARY_DEVICE
NO         NO       NO        NMS_SLIP
```

2. Change parameters as follows:
   - Bring the cursor to the beginning of the first field to be changed by pressing the space bar.
   - To change the selected field, press F or B to scroll among the available selections. When the desired selection is displayed, press the space bar to move to the next field.
3. After the desired parameter values are selected, press ENTER to end.

Kilomux will display the time and date fields, followed by the Kilomux prompt. In addition to the parameters listed in Supervisory Port Configuration Parameters in the Configuration Parameters appendix, *Table F-4* lists parameters that can be programmed only from the terminal:

Table F-4. Terminal Programmed Parameters

Designation	Function	Values
SPEED	Selects the data rate.	9.6, 19.2, 38.4 or 57.6 kbps
CTS - ON	The CTS line is always ON (active).	**=RTS** - The CTS line follows the RTS line.
DCD_DELAY	With the Kilomux supervisory port defined as DTE, indicates delay (in msec) between DCD=ON and the sending of data.	0, 10, 50, 100, 200, 300 msec
PWD	Controls password protection.	**YES** – Password is protected. **NO** – Password is not protected.
LOG_OFF	Controls the idle disconnect time:	**NO** - Automatic session disconnection disabled. **10_MIN** - Automatic disconnection after ten minutes if no input data is received by the Kilomux supervisory port.
DSR - ON	The DSR line is continuously on. It will switch to OFF for five seconds after the DTR line is switched OFF.	**=DTR** - The DSR line tracks the DTR line. When INTERFACE=DTE, the DSR line will switch to ON for five seconds when the RI line is ON while the DTR line is OFF.
POP_ALM	Controls the automatic display of alarms on the terminal.	**YES** - The terminal automatically displays every 10 minutes the alarm status (or whenever a new ON alarm is received, or an ON/OFF alarm changes state from OFF to ON. **NO** - The automatic display feature is disabled.
AUXILIARY-DEVICE	Selects the management mode supported by the Control port: ***Note:*** At any time, only one of the two ports of the KCL.2 module can be used for management access.	**NONE** - Control port is not operational. **TERMINAL** - Control port supports only management by means of a supervision terminal. **NMS SLIP** - The Control port connects to an SNMP management station and/or TELNET host using the SLIP protocol. **AGENT SLIP** - The network port is connected to another agent port using the SLIP protocol. **NMS PPP** - Same as NMS SLIP, except the PPP protocol is used. **AGENT PPP** - Same as AGENT SLIP, except the PPP protocol is used. ***Note:*** The SLIP and PPP selections are supported only when the Control port interface (selected by means of the internal KCL.2 switches).

DEF SYS

Purpose

Assign values to system parameters.

Format

```
DEF SYS
```

Use

1. To define system parameters, type:

   ```
   DEF SYS <ENTER>
   ```

   The first line of the system parameters data form is displayed. A typical form is shown below. The form presents the current parameter values as defaults.

```
CLK_MASTER     CLK_FBACK     DWLD_BW_A     DWLD_BW_B     ML_MODE      ML_RECOVERY
N/A            N/A           NO            NO            DUAL_LNK     AUTO

FRAME_MODE     LINK_CLK      RESET_VOICE
MANUAL         ML-A          DISABLE
```

The parameters displayed on the first page are listed in *Table F-5*.

Table F-5. System Parameters

Designation	Function	Values
CLK_MASTER, CLK_FBACK	Selects the main and fallback clock sources when the main links use independent timing, i.e., when NONE is selected for the LINK_CLK parameter. When using a KDI module for drop and insert purposes, it may be necessary to lock the main link timing, by selecting ML-A or ML-B for the LINK_CLK parameter: in this case, this field shows N/A (not applicable).	
DWLD_BW_A, DWLD_BW_B	Controls the use of management channels A or B. ***Note:*** These parameters must be set in order to allow in-band configuration of a remote Kilomux. When selecting a speed for the download parameter, consider the Kilomux link's total bandwidth. Since the bandwidth is shared, make sure that the speed chosen for the download parameter is high enough to allow the link to work efficiently, but that enough bandwidth is left for data transfer.	**NO** - Disables management channel. **0.8 to 19.2 kbps** - Management channel is enabled and uses the specified bandwidth. **EXT** - Management channel is enabled and uses either the dedicated time slot or time slot 0 (KML.8) or FDL (KML.7).

Table F-5. System Parameters (Cont.)

Designation	Function	Values
ML_MODE	When Kilomux-2100 includes two KML modules, you must define how to use the modules: When using a KDI module, always select the DUAL LINK mode.	**SINGLE** - Single main link operation. **REDUNDANCY** - The two KML modules operate as a redundant pair. **DUAL LINK** - The two KML modules provide two independent links. **PRIORITY BUMPING** - The two KML modules provide two parallel links with priority bumping. **SWITCHED BACKUP** - One of the KML modules provides the main link, and the other module provides the switched backup link. **SWITCH** - Single main link over ISDN line. **DUAL SWITCH** - Two main links over ISDN line. **SINGLE and SWITCH** - Single main link operation and single main link over ISDN line.
ML_RECOVERY	When using the redundancy or priority bumping mode, selects the method used to return to normal operation after a failure on the main link is corrected: **NOTE**: When using switched backup mode, the recovery is performed upon manual FLIP ML command.	**MANUAL** - Recovery upon manual command. **AUTO** - Automatic recovery. The criterion for recovery is controlled by means of the FLIP_INTEG time.
FRAME_MODE	Selects the main link bit allocation mode:	**MANUAL** – Manual allocation. This is the mode required for using the bypassing and multidrop functions supported by the KDI module. **AUTO** – Automatic allocation.
LINK_CLK	When a KDI module is installed in Kilomux-2100, selects the timing reference for the main links:	**ML-A** – Main link B timing is locked to main link A timing. **ML-B** – Main link A timing is locked to main link B timing. **NONE** – Main link A and main link B derive their timing references from the same external clock source, which is selected by means of the CLK_MASTER and CLK_FBACK fields.
FLIP_INTEG	Specifies the integration interval for determining whether it is necessary to switch to the backup link, and to detect return to normal operation of a failed link when using the AUTO method for main link recovery	**SHORT** – normal interval. **LONG** – longer interval, used if the link is marginal and it is necessary to wait a longer time before declaring that the link has indeed returned to normal operation.
RESET_VOICE	Not in use.	Always set to **DISABLE**.

2. After the desired parameter values are selected, press ENTER.

The next line of the system parameters data form is displayed:

```
SLOT:          3         4          OPTION
TYPE (DB):     KML.1     KML.10     ---
```

3. After the desired modules are selected, press ENTER.

   The next line of the system parameters data form is displayed. A typical line is shown below:

```
SLOT:         1      2        3      4      5        6
TYPE (DB):    ---    KLS.2    ---    ---    KLS.2    ---
```

   If you want to include in the Kilomux database a module that is not physically installed, e.g., to preprogram parameters so when the module is installed, it will start immediately to operate in the desired mode, select the desired module type for each empty slot as mentioned above. ***You can select a module type only if the slot is empty. If the slot is not empty, it automatically shows the type of the module physically installed in the slot. If the installed module is changed, the module type is automatically changed in the database.***

4. After the desired modules are selected, press ENTER.

   The last line of the system parameters data form is displayed:

```
SLOT:         7     8     9     10    11    12
TYPE (DB):    ---   ---   ---   ---   ---   ---
```

5. After the desired parameter values are selected, press ENTER to end.

DISCONNECT SWITCH

Purpose

Disconnects the remote Kilomux from the local Kilomux's main link over the ISDN switch line when the following is true:

- The Kilomux's main link is configured to manual operation and switch mode (refer to *DEF ML* command).
- The system is in switch mode (refer to *DEF SYS* command).

Format

```
DISCONNECT SWITCH [A] [B]
```

Use

1. Type

   ```
   DISCONNECT SWITCH A <ENTER>
   ```

   or

   ```
   DISCONNECT SWITCH B <ENTER>
   ```

Note *Use of this command is dependant on the configuration of the local Kilomux. The main link (A or B) must be attached to a KML.10 card whose parameters (set by the command DEF ML) are:*
- main_link_mode=SWITCH
- switch_mode=MANUAL
and the main link is 'master 'in_num_mode=NONE (set by the command DEF ML CALL)

DSP AGENT

Purpose

Display the IP and SNMP agent parameters.

Format

```
DSP AGENT
```

Use

- Type:

  ```
  DSP AGENT
  ```

  The following is displayed:

```
NAME = KM-RAD
CURRENT AGENT PARAMETERS
IP ADDRESS IS                    :192.115.71.44
SUBNET MASK IS                   :255.255.255.192
DEFAULT GATEWAY IS               :192.115.071.033
READ COMMUNITY IS                :public
WRITE COMMUNITY IS               :private
TRAP COMMUNITY IS                :public
MAC ADDRESS IS                   :00.20.D2.FD.1C.17
DATE: Thu 1998-07-30 TIME: 14:52:49
```

Note *Refer to the command DEF AGENT for an explanation of the information displayed by this command.*

DSP ALM

Purpose

Display the contents of the alarm buffer. This buffer can contain up to 100 alarms.

Format

```
DSP ALM [/C][/CA]
```

Use

- To display all the local Kilomux alarms, type:

  ```
  DSP ALM <ENTER>
  ```

- To display all the local Kilomux alarms and then clear the event alarms, type:

  ```
  DSP ALM /C <ENTER>
  ```

- To display all the local Kilomux alarms and then clear all the alarms, type:

  ```
  DSP ALM /CA <ENTER>
  ```

Display Format

A header precedes each block of alarms received from a Kilomux. The header lists the Kilomux node number and name and it serves as an easily identified separator between the alarms transmitted by different Kilomux units. The contents of the alarm buffer are displayed as a table with four columns: ALARM NUMBER, ALARM SYNTAX, ALARM STATE, and ALARM OCCURRENCE TIME.

For a description of the alarm messages that can be displayed by the terminal, refer to the *Alarms* appendix.

DSP BERT

Purpose

Display the result of the BER test running on the specified I/O module channel.

Format

```
DSP BERT {i:j} [/C]
```

Use

1. To display the current result of the BER test, type:

   ```
   DSP BERT i:j <ENTER>
   ```

   If for the selected module, e.g., for a KLS.2 module, only the composite channel BER test can be performed, type an asterisk * instead of the channel number in all the following commands. For example:

   ```
   DSP BERT i:* <ENTER>
   ```

   The terminal displays the current value of the BERT counter of the specified channel. The BERT count range is 0 through 65535. If the maximum value is reached, the counter holds this value until cleared (see next command option).

2. To display the current value of the BER counter, and then clear the counter, type:

   ```
   DSP BERT i:j /C <ENTER>
   ```

3. For continuous monitoring of the BER test running on the selected channel, type:

   ```
   DSP BERT i:j <ENTER>
   ```

4. To stop the monitoring, press BREAK or CTRL-C.

DSP CH CON

Purpose

Display the configuration of all the connected channels, i.e., all the channels for which a main link bandwidth allocation has been defined, even if not actually used.

Format

```
DSP CH CON
```

Use

- Type:

  ```
  DSP CH CON <ENTER>
  ```

The connected channels configuration table is displayed. A typical screen is shown below:

```
              ML          SPEED         CONTROL SIGNALS
CH. A:1       ML-A        9.6KBPS       LOCAL
CH. A:2       ML-A        19.2KBPS      LOCAL
   .             .           .             .
   .             .           .             .
   .             .           .             .
COMP A:*      ML-B        9.6KBPS       N/A
```

The display fields are explained below:

- **CH i:j** - Lists the channel identification.
  For modules for which there are no configurable channels, e.g., for KLS.2 modules, only the composite data can be displayed; in this case, the display shows COMP i:*.
- **ML** - Indicates the main link to which the channel is currently connected.
- **SPEED** - Shows the channel data rate, in kbps.
- **CONTROL SIGNALS** - Displays the control signal support mode for the corresponding channels. The following codes can appear:
  - **LOCAL** - Channel configured for local control signal support (data channel only).
  - **RTS** - Channel configured for end-to-end transmission of RTS line state (data channel only).
  - **DTR&RTS** - Channel configured for end-to-end transmission of DTR and RTS lines states (data channel only).
  - **SIGNALING** - Channel configured for end-to-end transmission of E and M signaling (voice channel only).
  - **N/A** - Not applicable: displayed in lines with COMP i:*.

DSP FLIP

Purpose

Display the cause of the last switching (flip) from one main link to the other.

This command is accepted only when Kilomux operates in the switched backup, priority bumping, or redundancy mode.

Format

```
DSP FLIP
```

Use

- Type:

```
DSP FLIP <ENTER>
```

The following message is displayed:

```
LAST FLIP CAUSED BY: 'cause'
```

The following 'cause' descriptions can be displayed:

- **NO FLIP** - No flip occurred.
- **FORCED FLIP** - Flipping occurred as a result of operator's command (*FLIP ML*).
- **ML CTS OR DSR IS OFF** - Flipping occurred because the CTS or DSR line in the interface of the KML module serving the previously used link had been switched off by the modem. This cause can appear only when the DSR&CTS main link parameter is set to EXT.
- **ML HARDWARE FAILURE** - Flipping occurred after a hardware failure has been detected in the KML module serving the previously used link.
- **ML LOCAL SYNC LOSS** - Flipping occurred because the local KML module serving the previously used link lost frame synchronization.
- **ML REMOTE SYNC LOSS** - Flipping occurred because the remote KML module serving the previously used link lost frame synchronization.
- **ON LINE ML REMOVED** - Flipping occurred because the KML module that was previously on-line has been removed from its slot.

DSP HDR TST

Purpose

Display the results of the last hardware test of the KCL and KPS modules (made during power-up self-test and during regular operation).

Format

```
DSP HDR TST
```

Use

- To display the hardware test report, type:

```
DSP HDR TST <ENTER>
```

Display Format

The display shows **NO ERROR** if everything checks well, or lists the detected problem:

```
DATABASE 1 CHKSUM ERROR
DATABASE 2 CHKSUM ERROR
I/O EXPANDER ERROR
COUNTER ERROR
PS-A 5 VOLT FAILURE
PS-A 12 VOLT FAILURE
PS-B 5 VOLT FAILURE
PS-B 12 VOLT FAILURE
```

Refer to the *Alarms* appendix for an interpretation of the error messages.

DSP MANAGER LIST

Purpose

Display the network management stations to which the SNMP agent of Kilomux sends traps. Each network management station is displayed by its IP address and the corresponding subnet mask.

Format

```
DSP MANAGER LIST
```

Use

- To display all the IP and SUBNET MASK addresses, type:

  ```
  DSP MANAGER LIST <ENTER>
  ```

  The following is displayed:

```
MANAGERS LIST PARAMETERS
-------------------------------
IP ADDRESS 1 IS      :=  000.000.000.000
SUBNET MASK 1 IS     :=  000.000.000.000
IP ADDRESS 2 IS      :=  000.000.000.000
SUBNET MASK 2 IS     :=  000.000.000.000
IP ADDRESS 3 IS      :=  000.000.000.000
SUBNET MASK 3 IS     :=  000.000.000.000
.
.
.
IP ADDRESS 10 IS     :=  000.000.000.000
SUBNET MASK 10 IS    :=  000.000.000.000
```

DSP KVF5 or DSP PBX

Purpose

Display the configuration parameters of the KVF.5 modules that comprise a group connected to the PBX interface.

Format

```
DSP PBX
```
or
```
DSP KVF5
```

Use

- Type:

  ```
  DSP PBX <ENTER>
  ```

  or

  ```
  DSP KVF5 <ENTER>
  ```

Display Format

A typical data form for a T1 group is shown below:

```
I/O   CARD
SLOT  TYPE        TS_GROUP     FROM_PBX  TO_PBX   CCS   ABCD  POLARITY  EXIST

5     KVF5/T1/M   05/1,2,3,4   A         B        N/A   0101  NORMAL    YES
6     KVF5/T1/S   05/5,6,7,8   N/A       N/A      N/A   N/A   N/A       NO
```

The fields appearing on the data form are as follows:

- **SLOT** - Displays the slot in which each module of the group is installed.
- **CARD TYPE** - Displays the module type installed in the corresponding slot: KVF5/T1/M or KVF5/T1/S for KVF.5 modules for T1, KVF5/E1/M or KVF5/E1/S for KVF.5 modules for E1 interface.
- **TS_GROUP** - Group of time slots served by the module installed in the corresponding slot.
- **FROM_PBX** - Signaling to be transferred through the Kilomuxes.
- **TO_PBX** - Signaling to be transmitted to the PBX.
- **CCS** - If the selected signaling mode is CCS (from and to PBX), then this field will indicate which time slot will carry the CCS information.
- **ABCD** - If the selected signaling mode is CAS (any bits selected except CCS), then the default A,B,C,D to be transmitted to the PBX is displayed in this field.
- **POLARITY** - Polarity of a bit, Normal/Inverted (for master module only).
  For the slave modules, displays N/A.
- **EXIST** - Indicates whether the module includes a sub interface.

DSP KVF6

Purpose

Display the configuration parameters of the KVF.6 modules in the Kilomux.

Format

```
DSP KVF6
```

Use

- Type:

```
DSP KVF6 <ENTER>
```

Typical data for E1/T1 cards is shown as follows:

```
IO SLOT   CARD_TYPE    FRAME    SIG_MODE    TS    A    B    C    D    EXIST

3         KVF6/T1/24   SF(D4)   CAS         N/A   A    B    N/A  N/A  YES
6         KVF6/E1/16   G.732S   CAS         N/A   A    B    A    B    NO
7         KVF6/T1/12   ESF      CAS         N/A   A    OT_A O    1    YES
8         KVF6/E1/31   G.732N   CAS         5     N/A  N/A  N/A  N/A  YES
```

The fields appearing on the data form are as follows:

- **SLOT** - Displays the slot in which each module of KVF.6 is installed.
- **CARD_TYPE** - Displays the module type installed in the corresponding slot: KVF.6/T1/24, KVF.6/T1/12, KVF.6/E1/31, or KVF.6/E1/16.
- **FRAME** - Displays the framing format of the KVF.6 module.
  - For KVF.6/E1/31 or KVF.6/E1/16 displays G.732N or G.732S.
  - For KVF.6/T1/24 or KVF.6/T1/12 displays SF(D4) or ESF.
- **SIG_MODE** - Displays the signaling operation mode of the KVF.6 module: CAS or CCS.
- **TS** - Displays the time slot number that carries the CCS information in the KVF.6 module, only if SIG_MODE is CSS. IF SIG_MODE is CAS, the N/A will be displayed in this field.
- **A,B,C,D** - Displays the information that will be sent through this bit to the PBX. The options are: A, B, C, D, NOT_A, NOT_B, NOT_C, NOT_D, 0, or 1.
- **EXIST** - Indicates whether the module exists in the Kilomux or not.

DSP SIGNALING or DSP SIG

Purpose

Display the signaling bits state in KVF.5 or KVF.6 modules.

Format

```
DSP SIGNALING {i}
```

or

```
DSP SIG {i}
```

Use

Displays the 4 CAS bits (A, B, C, D) of signaling for KVF.5 and KVF.6 modules for connected time slots. For each card that carries CAS information (signaling mode is CAS), all the connected timeslots will be displayed accompanied by their 4 CAS bits current information.

DSP PRBS_INJ

Purpose

Display the result of the PRBS test running on the specified I/O module channel.

Format

```
DSP PRBS_INJ {i:j} [/C]
```

Use

Same as for the *DSP BERT* command, except the use of `PRBS_INJ` instead of `BERT`. Note that if the PRBS test is activated without closing a loop along the signal path, errors will always be reported.

DSP REM AGENT

Purpose

Display the other Kilomux connected to the local Kilomux.

Format

```
DSP REM AGENT
```

Use

- Type:

  ```
  DSP REM AGENT <ENTER>
  ```

  Kilomux displays the following:

```
NAME = mid
IP Address          MUX Name      Distance      Physical_Distance
----------          --------      --------      -----------------
192.115.71.39         down          006                 1
192.115.71.38         up            006                 3

TIME: HH:MM:SS      DATE: Day MM,DD,YY
```

DSP REV

Purpose

Display the list of modules installed in the Kilomux module and the hardware and software versions of each module.

Format

```
DSP REV { [*] [i] }
```

Use

1. To display information on all the modules, type:

   ```
   DSP REV * <ENTER>
   ```

   The supervision terminal displays the list of slots in which modules that include programmable components can be installed, the type of module installed in each slot, and the module hardware and software revision.

The general organization of the display is illustrated below.

```
CARD TYPE        SOFTWARE REV.    HARDWARE REV
SLOT 3 ML        XX.YY            XX.YY
SLOT 4           XX.YY            XX.YY
SLOT 5           XX.YY            XX.YY
SLOT OPTIONS     XX.YY            XX.YY
SLOT 1           XX.YY            XX.YY
SLOT 2           XX.YY            XX.YY
  .              XX.YY            XX.YY
  .              XX.YY            XX.YY
SLOT 12          XX.YY            XX.YY
```

2. To display the information related to a specific module, type:

   `DSP REV i <ENTER>`

   where i is the number of the Kilomux slot of the desired module (3, 4, 5, OP, and I/O slots 1 through 12).

DSP ST FRAME

Purpose

Display information on the frame structure and the use of the available main link bandwidth. Refer to the *General Information* chapter for additional information.

Format

`DSP ST FRAME {A B}` or `DSP ST FR {A B}`

Use

1. To display frame information for main link A, type:

   `DSP ST FRAME A <ENTER>` or `DSP ST FR A<R>`

   If Kilomux is equipped with only one main link module, it is not necessary to identify the main link.

2. To display frame information for main link B, type:

   `DSP ST FRAME B <ENTER>` or `DSP ST FR B<R>`

Display Format - AUTO Frame Bit Allocation

A typical DSP ST FRAME display when the frame bit allocation mode (selected by means of the *DEF SYS* command) is automatic is shown below:

```
FRAME LENGTH         = XXX BIT (XXX KBPS)
BIT WEIGHT           = XXX KBPS
DATA USAGE           = XXX KBPS
CONTROL USAGE        = XXX KBPS
DOWNLOAD USAGE       = XXX KBPS
SYNC USAGE           = XXX KBPS
TOTAL USAGE          = XXX KBPS
TOTAL FREE           = XXX KBPS
```

The display fields are as follows:

- **FRAME LENGTH** - Total number of bits contained in one main link frame, and the main link data rate, in kbps.
- **BIT WEIGHT** - Main link bandwidth allocation unit, in kbps.
- **DATA USAGE** - The main link bandwidth allocated to user data, in kbps.
- **CONTROL USAGE** - The main link bandwidth allocated to the transfer of user end-to-end signaling in kbps.
- **SYNC USAGE** - The main link bandwidth allocated to the frame synchronization word, in kbps.
- **DOWNLOAD USAGE** - The main link bandwidth allocated to the management channel, in kbps.
- **TOTAL USAGE** - The total main link bandwidth currently allocated, in kbps.
- **TOTAL FREE** - The total main link bandwidth, in kbps, that is not yet allocated and is free.

Display Format - MANUAL Frame Bit Allocation

A typical DSP ST FRAME display when the frame bit allocation mode (selected by means of the *DEF SYS* command) is manual is shown below:

```
FRAME LENGTH = 160 BIT (128.0 KBPS)
BIT WEIGHT   = 0.800 KBPS
BYPASS_START = 16         BYPASS_SIZE = 20

I/O    CH1_START  CH1_SIZE  CH2_START  CH2_SIZE  CNTRL_START CNTRL_SIZE LAST_BIT
SLOT

01     000        012       000        000       012         001        012
06     014        012       000        000       000         000        025
```

The display shows the number of bits in the frame, and the bit "weight" (main link bandwidth allocation unit), followed by the bypass information and bandwidth utilization of each slot:

- **BYPASS_START** - The number of the first bit in the block of bits being bypassed.
- **BYPASS_SIZE** - The total number of bits being bypassed.
- **CH_START** - The number of the first bit in the block of bits assigned to the channel of the module installed in the corresponding slot.
- **CH_SIZE** - The total number of bits assigned to the channel of the module installed in the corresponding slot.
- **CNTRL_START** - When end-to-end transmission of control signals is used, shows the number of the first bit in the block of bits assigned to carry the control signals of the module installed in the corresponding slot.
- **CNTRL_SIZE** - When end-to-end transmission of control signals is used, shows the total number of bits assigned to carry the control signals of the module installed in the corresponding slot.
- **LAST_BIT** - The number of the last bit in the block of bits assigned to the module installed in the corresponding slot.

DSP ST ML

Purpose

Display the status of the desired KML module.

Format

```
DSP ST ML {A B}
```

Use

- To display the status of the KML module installed in slot 3, type:

  ```
  DSP ST ML <ENTER> or DSP ST ML A <ENTER>
  ```

- To display the status of the KML module installed in slot 4, type:

  ```
  DSP ST ML B <ENTER>
  ```

General Display Format

A typical DSP ST display is shown below:

```
ACTIVE ML=                ML-A
SOFTWARE REVISION=        XX.YY
HARDWARE REVISION=        XX.YY
ALARMS=                   NONE
INTERFACE TYPE=           V.35
ML LOOP=                  NONE
```

The display fields are as follows:

- **ACTIVE ML** - Displays the currently-active KML module: ML-A for the KML module installed in slot 3, ML-B for the module installed in slot 4, or BOTH for a Kilomux operating in the dual link, priority bumping or switched backup mode.
- **SOFTWARE REVISION** - The software revision of the KML module.
- **HARDWARE REVISION** - The hardware revision of the KML module.
- **ALARMS** - Displays the alarms related to the corresponding main link:
  - **NONE** - No alarm has been reported.
  - **LOCAL SYNC LOSS** - The local Kilomux lost frame synchronization.
  - **REMOTE SYNC LOSS** - The remote Kilomux reports the loss of frame synchronization. This message can appear only when down-loading is enabled.
- **INTERFACE TYPE** - Displays the interface type of the selected KML module.
- **ML LOOP** - Displays the state of the loops on the selected KML module:
  - **NONE** - No loop is active
  - **R** - Remote loop active
  - **L** - Local loop active
  - **L-V54.2** - The V.54 loop 2 is active
  - **L-V54.3** - The V.54 loop 3 is active.

Display Format - KML.10 Module

A typical DSP ST display for a KML.10 module is shown below.

```
ACTIVE ML=                          ML-B
SOFTWARE REVISION=                  1.1
HARDWARE REVISION=                  1.2
ALARMS=                             NONE
INTERFACE TYPE=                     ISDN
ML LOOP=                            NONE

MAIN LINK B INTERFACE - ISDN STATUS PARAMETERS
==============================================
ISDN INTERFACE = S
PIGGYBACK INTERFACE TYPE = IB-SW/'ISDN VERSION' REL. 2.0
ISDN DISCONNECT CAUSE =
ISDN CALL STATUS = CONNECTED
ISDN LAYER1 = CONNECTED
ISDN LAYER2 = CONNECTED
```

The general display fields are as follows:

- **ACTIVE ML** - Displays the currently-active KML module:
  - **ML-A** for the KML module installed in slot 3,
  - **ML-B** for the module installed in slot 4, or
  - **BOTH** for a Kilomux operating in the dual-link, priority bumping or switched backup mode.
- **SOFTWARE REVISION** - The software revision of the KML.10 module.
- **HARDWARE REVISION** - The hardware revision of the KML.10 module.
- **ALARMS** - Displays the alarms related to the corresponding main link:
  - **NONE** - No alarm has been reported.
  - **LOCAL SYNC LOSS** - The local Kilomux lost frame synchronization.
  - **REMOTE SYNC LOSS** - The remote Kilomux reports the loss of frame synchronization. This message can appear only when downloading is enabled.
- **INTERFACE TYPE** - Displays the interface type of the selected KML.10 module, ISDN. And for KML.11 the interface is IP.
- **ML LOOP** - Displays the state of the loops on the KML.10 module:
  - **NONE** - No loop active
  - **R** - Remote loop active
  - **L** - Local loop active.
- **ML IP** – If the main link is KML.11 the following will be displayed:
  - **ETHERNET RATE** - 10 Mbps or 100 Mbps
  - **AUTONEGOTIATION MODE** – Half duplex or full duplex
  - **NO. OF TX FRAMES IS:** X

- **NO. OF RX FRAMES IS:** y
- **ML INTERFACE:** RJ-45 or Fiber.

Note

Using the CLR LAN STAT command can clear TX and RX frames.

The ISDN-specific display fields are as follows:

- **ISDN INTERFACE** - Displays the interface type: S for a KML.10/S module, and U for a KML.10/U module.
- **PIGGYBACK INTERFACE TYPE** - For operation on switched lines, displays the ISDN implementation version currently selected for use on the selected module, and the release number of the ISDN support package installed on the module. For operation on leased lines, displays LEASED LINE.
- **ISDN DISCONNECT CAUSE** - displays the last disconnect cause code. The codes are in the range of 001 through 127, and they comply with the ITU-T Rec. Q.921.
- **ISDN CALL STATUS** - Displays the status of the ISDN call in which the KML.10 module is engaged:
  - **DIALING** - The call is being set up.
  - **CONNECTED** - The call is connected.
  - **DISCONNECTING** - The call is in the process of being disconnected.
  - **DISCONNECTED** - The call has been disconnected.
- **ISDN LAYER1** - Displays the current state of the layer 1 protocol:
  - **CONNECTED** - Layer 1 is connected.
  - **DISCONNECTED** - Layer 1 is not connected.
- **ISDN LAYER2** - Displays the current state of the layer 2 protocol**:**
  - **CONNECTED** - Layer 2 is connected.
  - **DISCONNECTED** - Layer 2 is not connected.

DSP ST SLOT

Purpose

Display information on the module installed in one of the slots OP, and I/O slots 1 through 12.

Format

```
DSP ST i
```

Use

- To display information on the module installed in the desired I/O slot, type:

```
DSP ST i <ENTER>
```

Where i is the I/O slot number, in the range of 1 through 12, or OP (for the OPTIONS slot).

Display Format

A typical DSP ST SLOT status is shown below:

```
DATABASE:               module type
HARDWARE:               module type
SOFTWARE REVISION:      XX.YY
HARDWARE REVISION:      XX.YY
HARDWARE FAILURE:       YES, NO
OPERATED HIGHWAY:       ML-A
                        CONNECT   INTERFACE   LOOP
CH i:1                  YES       V35         NONE
CH i:2                  NO        V35         NONE
```

The display fields are as follows:

- **DATABASE** - Lists the module type, as stored in the database.
- **HARDWARE** - Lists the module type of each active installed module, as reported by the module itself.
- **SOFTWARE REVISION** - Lists the software revision of the module.
- **HARDWARE REVISION** - Lists the hardware revision of the module.
- **HARDWARE FAILURE** - Indicates whether a hardware failure has been detected in this module during the power-up self-test or during regular operation.
- **OPERATED HIGHWAY** - Indicates the internal Kilomux bus to which the specified module is connected:
  - **ML-A** - Module connected to the bus of main link A.
  - **ML-B** - Module connected to the bus of main link B.
  - **NC (PB)** - Module is not connected to a main link bus (displayed only when the priority bumping or the switched backup mode is used).

In addition, the display provides the following information for each of the channels available on this module.

The channel number, B, is identified in the left-hand column (CH i:j). If the module installed in the selected slot does not include channels recognizable by the Kilomux KCL module, e.g., it is a KLS.2 module, the information is presented only for the module composite channel, and the left-hand column shows COMP A:*.

- **CONNECT** - Indicates whether this channel has been allocated bandwidth on the main link (is “connected” to the main link):
  - **YES** - The channel has been allocated main link bandwidth and therefore it can carry traffic.
  - **NO** - The channel cannot carry traffic.
- **INTERFACE** - Shows the channel interface selected by means of the internal interface changer boards. This field is relevant only to data I/O modules with

selectable interface, e.g., KHS.1: for other modules, this field shows NA (not applicable).

- **LOOP** - Indicates the tests and/or loops that are currently activated on this channel, or NONE. For the list of tests and loops available on each module, refer to the relevant module Installation and Operation Manual.

When using the KVF.5 I/O module with A and B signaling, this command displays the A and B signaling state. Kilomux receives the A and B signaling state from the PBX.

The status display of a typical KVF.6 I/O module adds the following information:

```
FRAME = G732S
CRC4 = NO
OOS = F-I
GAIN LIMIT = SHORT_H(dsu)
E1/T1 LOOP = NONE
              ECHO  CODING TX      RX      FAX        CH             TIME_SLOT
         SPEED CNCL  LAW    GAIN    GAIN    GAIN       TYPE  LOOP     GROUP
CH 01:1 4*4.8 OFF   a_Law  0dBm    0dBm    -9.5dBm    V+F   NONE     1,2,3,4
CH 01:2 4*4.8 OFF   u_Law  0dBm    0dBm    -9.5dBm    V+F   NONE     5,6,7,8
CH 01:3 4*4.8 OFF   u_Law  0dBm    0dBm    -9.5dBm    V+F   NONE     9,10,11,12
CH 01:4 4*4.8 OFF   u_Law  0dBm    0dBm    -9.5dBm    V+F   NONE     13,14,15,16
```

For an explanation of the display fields, refer to the *Configuration* chapter of the KVF.6 Installation and Operation Manual.

DSP ST SYS

Purpose

Display system status information.

Format

```
DSP ST SYS [option]
```

Use

- To view the current system status, type:

```
DSP ST SYS <ENTER>
```

Display Format

A typical system status display, including typical module type identifications, is shown below:

```
NAME                  = [mux name]
LAST RESET            = [date and time of last reset on KCL.2]
ON LINE DATABASE      = 1
NODAL CLOCK           = ML
ACTIVE ML             = ML-A
ACTIVE ML TIMING      = DTE
ML MODE               = SINGLE
MONITOR               = NONE
ALARM RELAY           = ON

INSTALLED MODULES:
ML/IO:      ML-A       ML-B       OPTION     1          2            3
DB:         ML         ---        ---        ---        KLS.1/N      ---
HW:         ML.1       ---        ---        ---        KLS.1/N      ---

IO:         4          5               6         7        8         9
DB:         ---        KVF.5/E1/M      ---       ---      ---       KVF.4/S0
HW:         ---        KVF.5/E1/M      ---       ---      ---       KVF.4/S0

IO:         10         11         12
DB:         ---        ---        ---
HW:         ---        ---        ---
TIME:08:14:34  DATE:Mon Jun,08,1998
```

The display fields are as follows:

- **NAME** - Lists the logical name assigned to Kilomux.
- **LAST RESET** - Displays the date and time of the last reset on KCL.2.
- **ON LINE DATABASE** - Indicates the number of the active database: 1 or 2.
- **NODAL CLOCK** - Indicates the source for the link transmit clock: the internal oscillator, a module channel, or the main link (ML). ML can only appear when the main link timing mode is DTE. Refer to the *Configuration Parameters* appendix for additional information.
- **ACTIVE ML** - Indicates the currently-active KML module(s): ML-A for the KML module installed in slot 3, and/or ML-B for the module installed in slot 4, or BOTH for a Kilomux operating in the dual link, priority bumping or switched backup mode.
- **ACTIVE ML TIMING** - Source clock of the agent.
- **ML MODE** - Indicates the current main link mode: SINGLE, REDUNDANCY, DUAL LINK, PRI_BMP, SW_BACK.
- **MONITOR** - Indicates the module channel monitored by means of the Kilomux front panel indicators, or NONE.
- **ALARM RELAY** - Indicates the status of Kilomux alarm relay contacts: ON or OFF.
- **INSTALLED MODULES** - Lists, for each slot, the installed module and the module programmed in the database.

EDIT DB

Purpose

Select a database on which the following commands will be executed. The selected database is identified by the working prompt:

- KM2100> for the on-line database (the database now used by Kilomux-2100)
  or
  KM2104> for the on-line database (the database now used by Kilomux-2104)
- ALT_DB> for the off-line database.

Format

```
EDIT DB
```

Use

1. To select the other database while working on the on-line database, type at the KM2100> or KM2104> prompt:

   EDIT DB <ENTER>

   The working prompt changes to ALT_DB>.
2. To select the on-line database while working on the alternate database, type at the ALT_DB> prompt:

   EDIT DB <ENTER>

   The working prompt changes to KM2100> or KM2104>.

Note *When you exit the configuration program and return the control to the LCD, the database currently defined to be on-line (irrespective of the database being edited) is forced to remain the on-line database.*

EXIT

Purpose

End the current session and return control to the Kilomux front panel.

Format

```
EXIT
```

Use

- Type:

```
EXIT <ENTER>
```

The DSR line of the SP port is switched off for 5 seconds. The supervisory port prompt disappears, and the TERMINAL ON LINE message previously displayed by Kilomux is replaced by the default display, ALARM BUFFER.

F

Purpose

Define the codes used to be sent to the supervision terminal to perform the following terminal control functions:

- Clear screen
- Move cursor to screen home position
- Move cursor to the right by one position.

This command lets you enter manually the desired codes. However, if you are using a VT-52, VT-100, TV-920, FREEDOM-100, FREEDOM-110, or FREEDOM-220 terminal, or a terminal, which is compatible with one of the terminals, listed above, you can use the `INIT F` command to select automatically the corresponding control sequences.

Format

```
F
```

Use

1. To display the current codes, type:

   ```
   F <ENTER>
   ```

   The terminal function entry screen is displayed. The screen includes three separate lines, displayed one after the other. A typical screen, showing all the three lines, is shown below:

   ```
   CLEAR SCREEN =hhhhhhhh (clear screen code)
   CURSOR HOME  =hhhhhhhh (cursor home code)
   CURSOR RIGHT =hhhhhhhh (cursor right code)
   ```

   where `h` indicates hexadecimal digits.

2. To change a code, bring the cursor under the first digit of the code to be changed, by pressing ENTER, then enter the appropriate hexadecimal digit.
3. Repeat the procedure until all the necessary digits are changed.

FLIP ML

Purpose

Change the active KML module in a redundant system.

Format

```
FLIP ML
```

Use

- To change the active KML module, type:

```
FLIP ML <ENTER>
```

HELP

Purpose

Display an index of the supervisory port commands and the options available for each command.

Format

```
H [1] [2] [3] [4]
```

Use

- To display all the pages of the HELP system, type:

  ```
  H <ENTER>
  ```

- To display a specific page of the HELP system, e.g., page 1, type:

  ```
  H 1 <ENTER>
  ```

INIT DB

Purpose

Load the default parameters values instead of the user configuration in the Kilomux database (see *Table F-6*).

This command is available only on a master Kilomux.

Format

```
INIT DB
```

Use

1. To load the default parameters, type:

   ```
   INIT DB <ENTER>
   ```

2. Kilomux displays the time and date fields, followed by the Kilomux prompt.

Table F-6. Kilomux Default Configuration Used with Supervision Terminal

Parameter Type	Parameter Designation	Default Value
System	CLK_MASTER	INT
	CLK_FBACK	NONE
	DOWNLOAD_BW	MIN
	ML MODE	SINGLE
	ACTIVE_ML	AUTO
Link	SPEED	64K
	INTERFACE	DCE
	BUFFER_SIZE	8
Channel	PROTOCOL	ASYNC
	SPEED	NC
	ASYNC_DATA	6
	TIMING	DCE
	CTRL_SIG	LOCAL
	CTS	ON
	RTS_CTS_DEL	MIN
	INTF	4-WIRE
	TX_LEVEL	+8dBm
	RX_LEVEL	+2dBm
	OOS	F-B
SP (Supervisory Port)	SPEED_BPS	9600
	DATA	8
	PARITY	NONE
	INTERFACE	DCE
General	CLEAR SCREEN	00000000
	CURSOR HOME	00000000
	CURSOR RIGHT	00000000

INIT F

Purpose

Set all the terminal control codes (cursor home, cursor right, and clear screen) to 0, or select the control codes corresponding to one of the supported terminals: VT-52, VT-100, TV-920, FREEDOM-100, FREEDOM-110, or FREEDOM-220.

If your terminal is not compatible with one of the supported terminals, use the *F* command to enter manually the required sequences.

The codes used by typical terminals are listed in the following table.

Table F-7. Codes Used by Typical Terminals

Function	Terminal Type				
	TV920	VT52	VT100	Freedom 100/110	Freedom 220
Clear Screen	1B2A0000	N/A	1B5B324A	1B2A0000	1B5B324A
Cursor Home	1E000000	1B480000	1B5B4800	1E000000	1B5B4800
Cursor Right	0C000000	1B430000	1B5B3143	0C000000	1B5B3143

Format

```
INIT F 'terminal'
```

Use

1. To select the control codes for one of the supported terminal types, type:

   ```
   INIT F 'terminal' <ENTER>
   ```

   where `'terminal'` stands for the terminal name.

2. To reset the control codes to 0, type

   ```
   INIT F <ENTER>
   ```

LOAD DB

Purpose

Loads the Kilomux database to a file to enable transfer to a remote Kilomux via TFTP. This enables you to control a remote Kilomux database and to configure other Kilomuxes with the same database. Refer to the *Update DB 1\2* command.

Note *Loading the database is performed from a file named CNFG.DAT. Configure the local/remote file of your TFTP application to point to this file.*

Use

1. Load db 1 <ENTER> for the first database of the Kilomux
2. Load db 2 <ENTER> for the second database of the Kilomux

LOAD IO

Purpose

Software download to KVF.6 or KVF.8 modules, through a DL connection in the modules front panel, or from the KCL (Common Logic) card

Format

```
LOAD IO i DL or LOAD IO i KCL
```

Use

To perform software download using DL cable to KVF.6 or KVF.8 module installed in the Kilomux, type:

1. Load IO i DL<ENTER>

   where i is the I/O slot number (1 through 12)

   – Wait until the TST LED in the card starts to blink. Connect your download cable to the specified DL connection in the card and connect the other end to one of the communication ports in the PC. Use your download application in the PC to load the software.

To perform software download through the Kilomux common logic, to KVF.6, or KVF.8 module installed in the Kilomux, type:

2. Load IO i KCL <ENTER>

   where i is the I/O slot number (1 through 12)

   – Wait until the TST LED in the card starts to blink. The system will load the software automatically from the KCL through the internal BUS.

LOAD ML [A] [B]

Purpose

Software download to or KML.11 modules, through a DL connection in the modules front panel, or from the KCL (Common Logic) card

Format

```
LOAD ML i DL or LOAD ML i KCL
```

Use

To perform software download to KML.11 module installed in the Kilomux, type:

1. Load ML i <ENTER>

   where i stands for A (for module A and B for module B

2. Wait until KCL.2 finishes transferring the new KML.11 software through the internal bus.

LOOP

Purpose

Activate tests. For main link test loops, you can define their duration: after the specified time, the loop is automatically disconnected. If you do not specify the loop duration, it remains permanently connected.

- Refer to the *Diagnostics* chapter for the allowable loop combinations.
- Refer to the *Diagnostics* chapter for a description of the loops available on the Kilomux main link.
- Refer to the relevant module Installation and Operation Manual, for a description of the tests available on the corresponding module.

Format

```
LOOP [loopname] {ML A  ML B  i:j}
or
LP [loopname] {ML A  ML B  i:j}
or
LP_R {ML A  ML B  i:j} /T
```

Use

1. To activate a specific type of loop on main link A, type:

```
LOOP L ML A <ENTER>        or   LP L ML A <ENTER>
LOOP V54.2 ML A <ENTER>    or   LP V54.2 ML A <ENTER>
LOOP V54.3 ML A <ENTER>    or   LP V54.3 ML A <ENTER>
```

2. To activate a specific type of loop on main link B, type:

```
LOOP L ML B <ENTER>        or   LP L ML B <ENTER>
LOOP V54.2 ML B <ENTER>    or   LP V54.2 ML B <ENTER>
LOOP V54.3 ML B <ENTER>    or   LP V54.3 ML B <ENTER>
```

3. To activate a specific type of timed loop on a main link for 5 minutes, type:

```
LP_R ML B /5<ENTER
LP_R ML A /5<ENTER
```

Note

If Kilomux operates in the SINGLE mode, it is not necessary to specify the link, e.g., you can type LOOP L ML <ENTER> instead of LOOP L ML A <ENTER> or LOOP L ML B <ENTER>.

4. To activate a test or loop on the desired channel, type:

```
LOOP L i:j <ENTER>          or  LP L i:j <ENTER>
LOOP R i:j <ENTER>          or  LP R i:j <ENTER>
LOOP PRBS_INJ i:j <ENTER>   or  LP PRBS_INJ i:j <ENTER>(data channel only)
LOOP BERT i:j <ENTER>       or  LP BERT i:j <ENTER>     (data channel only)
LOOP TONE_INJ i:j <ENTER>   or   LP TONE_INJ i:j <ENTER> (voice channel only)
```

ML RECOVERY

Purpose

When Kilomux is configured for operation with manually controlled switched backup or priority bumping (refer to *DEF SYS* command), this command is used to initiate recovery from a priority bumping or switching to the backup link event, and return to normal operation.

Format

```
ML RECOVERY <ENTER>
```

Use

- To initiate return to normal operation, type:

```
ML RECOVERY <ENTER>
```

MONITOR

Purpose

Select the desired I/O module channel for monitoring.

Format

```
MONITOR i:j or M i:j
```

Use

- To select a module channel, type:

  `MONITOR i:j <ENTER> or M i:j <ENTER>`

  where i is the number of the I/O slot number (1 through 12).

REBUILD FRAME

Purpose

Rebuild the Kilomux frame.

The Kilomux frame is updated according to the activated channels (in the order they were inserted). When an I/O card is taken in/out, the frame is updated.

REBUILD FRAME should be used after a change in the Kilomux channels.

Format

`REBUILD FRAME [A] [B]`

Use

- To rebuild the Kilomux frame, type:

`REBUILD FRAME [A] <ENTER>` or `REBUILD FRAME [B] <ENTER>` for ML-A channels or ML-B channels.

The following message appears:

```
Updating Frame
DATE: xxx   yyyy-dd-mm  TIME: hh:mm:ss
```

RESET LOC

Purpose

Reset the local Kilomux.

Format

`RESET LOC`

Use

- To reset the local Kilomux, type:

  `RESET LOC <ENTER>`

RESET IO

Purpose

Reset I/O module

Format

```
RESET IO i
```

Use

- To reset the I/O module installed in the Kilomux, type:

  ```
  RESET IO i <ENTER>
  ```

  where i is the I/O slot number, (1 through 12).

RESET ML

Purpose

Reset ML module

Format

```
RESET ML {A or B}
```

Use

- To reset ML module type:

  ```
  RESET ML {A or B} <ENTER>
  ```

  where A is referenced to ML_A slot, and B to ML_B slot.

TIME

Purpose

Set the time for the Kilomux internal real time clock.

Format

```
TIME
```

Use

1. To set the time, type:

   ```
   TIME <ENTER>
   ```

   Kilomux sends the time entry form:

   ```
   Time
   Hour   = 12
   Minute = 25
   Second = 16
   ```

2. Bring the cursor to the first field to be changed by pressing ENTER.
3. Change the selected field by pressing F to increase and B to decrease the displayed values. When done, press ENTER to move to the next field.
4. Set the time about one minute beyond the current time, and then press ENTER at the correct instant.

Kilomux displays the time and date fields (note that time has changed), followed by the Kilomux prompt.

UPDATE DB 1\2

Purpose

Updates the Kilomux database from a file with a database package that was received from a remote Kilomux via TFTP.
This enables you to control a remote Kilomux database and to configure other Kilomuxes with the same database. Refer to the *Load DB 1\2* command.

Note *Updating the database is performed from a file named CNFG.DAT. Configure the local/remote file of your TFTP application to point to this file.*

Use

- Update db 1 <ENTER> for the first database of the Kilomux
- Update db 2 <ENTER> for the second database of the Kilomux

Appendix G
Kilomux Application Guide

G.1 General

This appendix presents various applications in which Kilomux-2100/2104 is utilized, the applications are divided into groups, each for different application type. The following main application groups are discussed:

- Simple Point to Point Applications
- CVS Applications
- ISDN Applications
- Advanced Point to Point Applications
- Dual Link Applications

G.2 Simple Point to Point Applications

Data and Voice Application

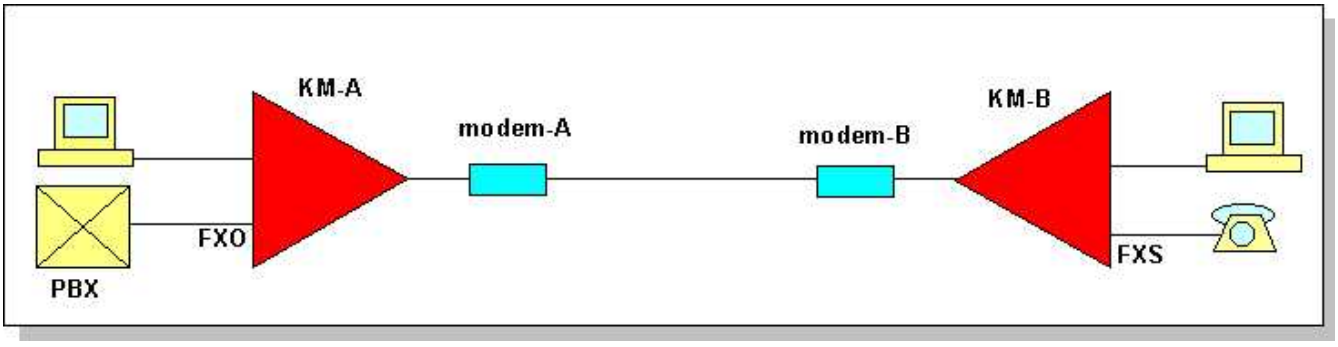


Figure G-1. Data and Voice Application

Satellite Application

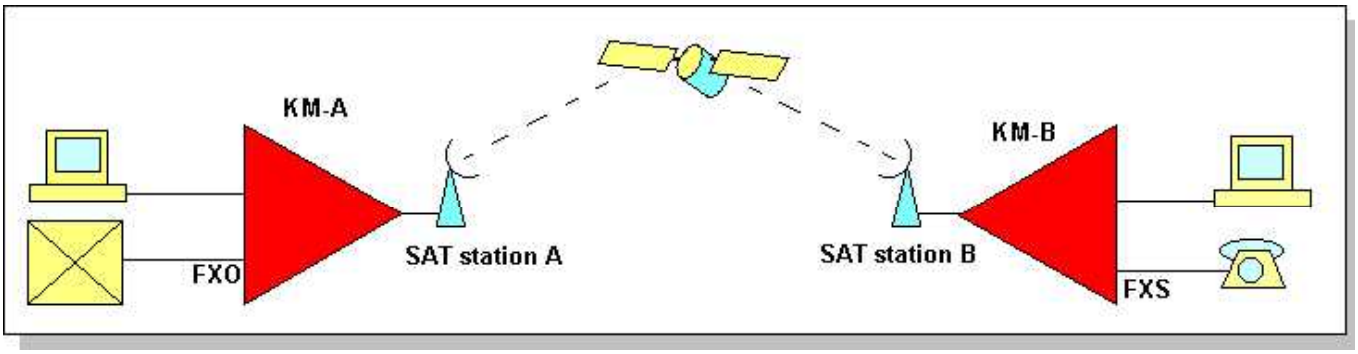


Figure G-2. Satellite Application

G.3 CVS Applications

Transmitting Full Digital Trunk

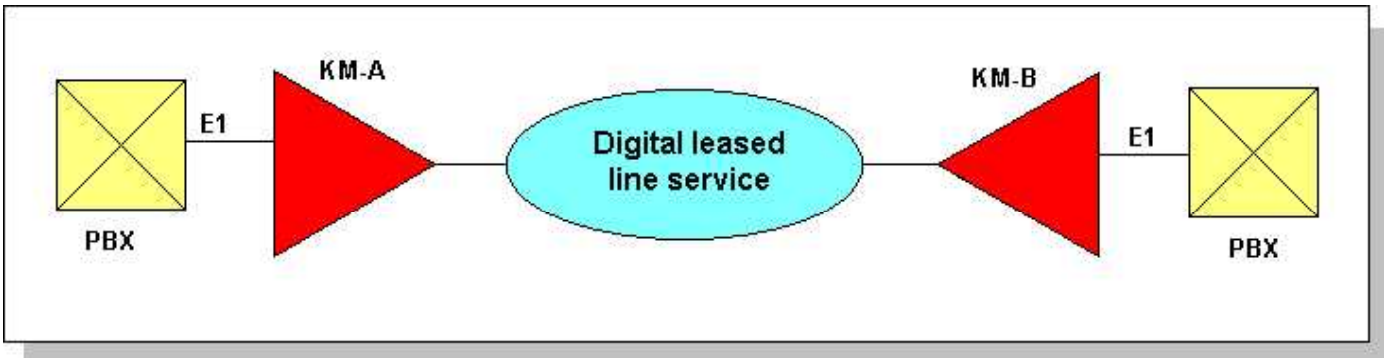


Figure G-3. Transmitting Full Digital Trunk

Digital Trunk to Analog Conversion

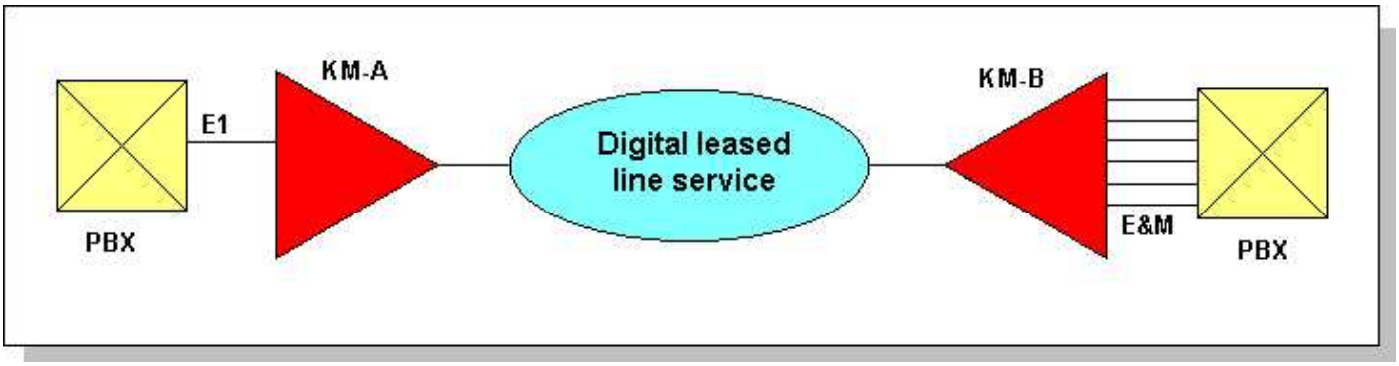


Figure G-4. Digital Trunk to Analog Conversion

Digital Trunk with Protocol Conversion

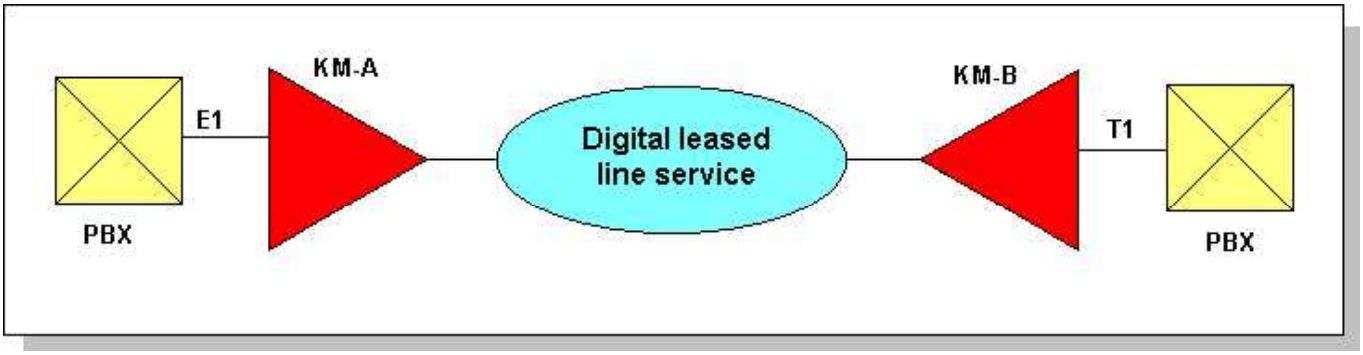


Figure G-5. Digital Trunk with Protocol Conversion

G.4 ISDN Applications

Using ISDN Main Link on 128kbps

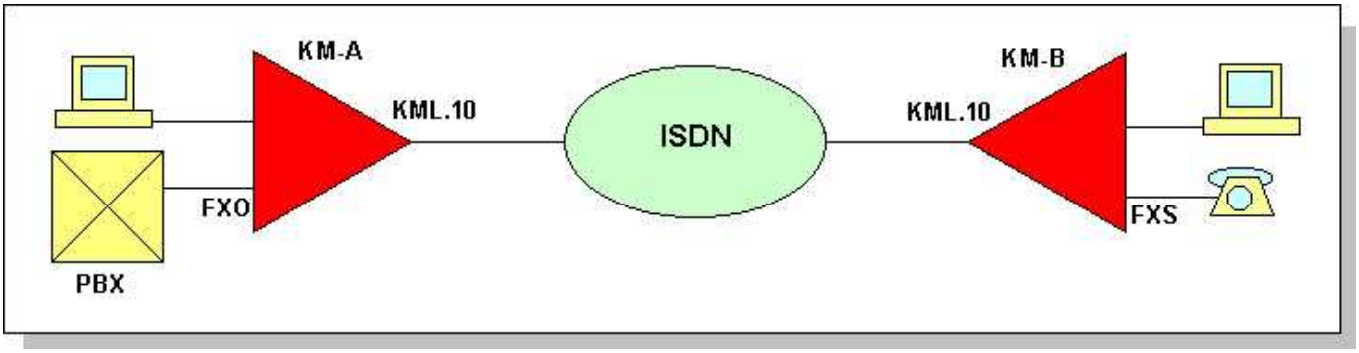


Figure G-6. Using ISDN Main Link on 128kbps

Transparent ISDN Connection

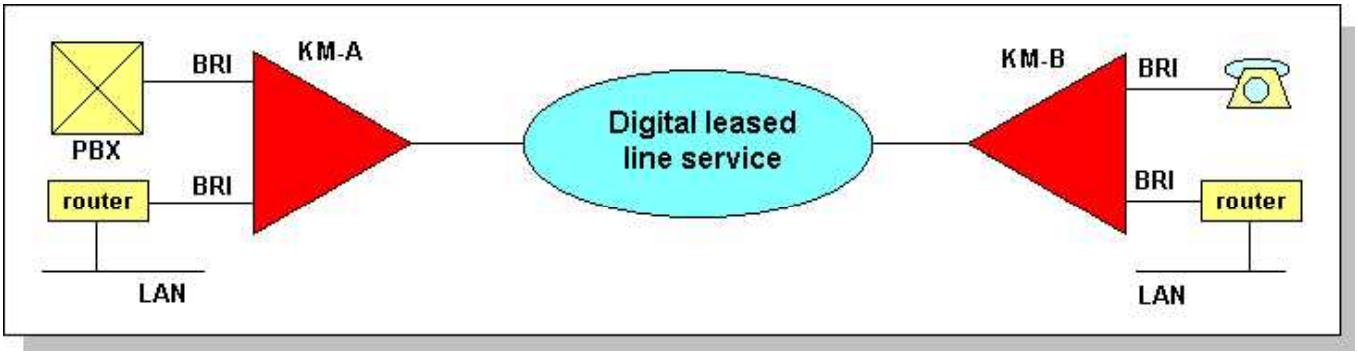


Figure G-7. Transparent ISDN Connection

ISDN Voice Over ISDN Main Link

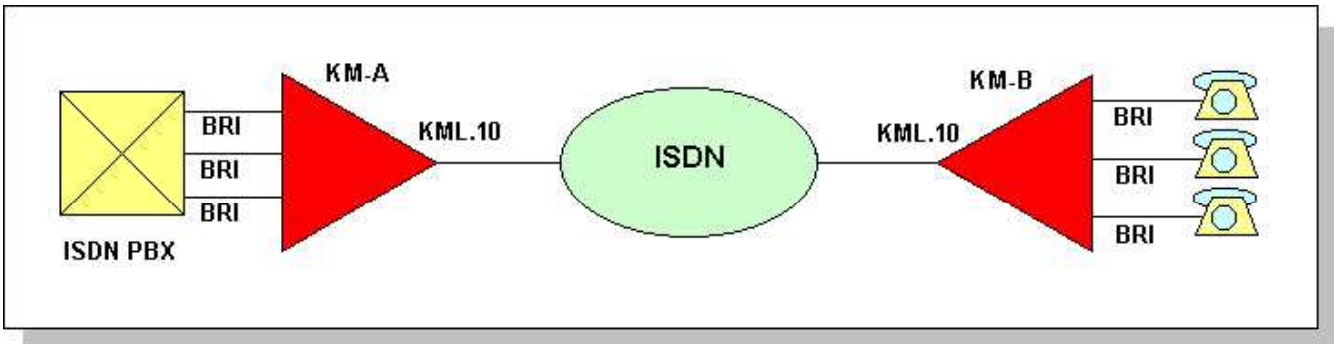


Figure G-8. ISDN Voice Over ISDN Main Link

Connection on Demand with Data

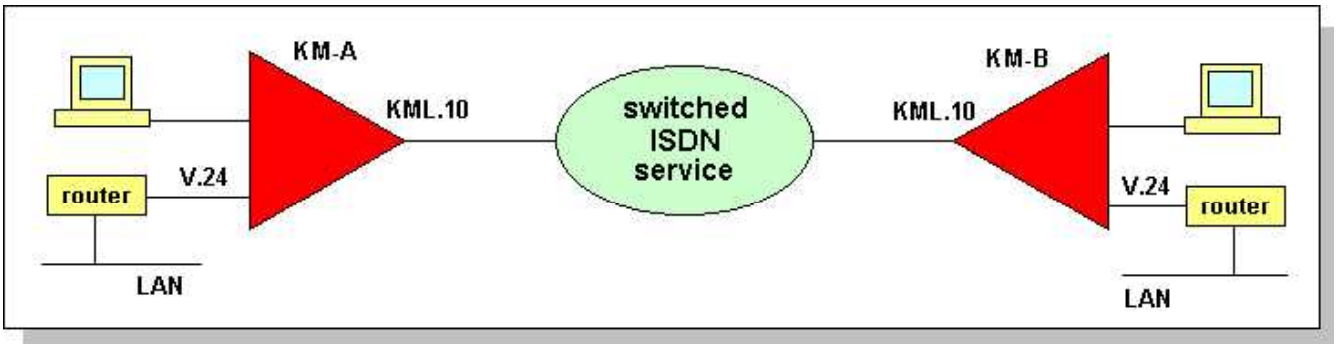


Figure G-9. Connection on Demand with Data

Connection on Demand with Voice

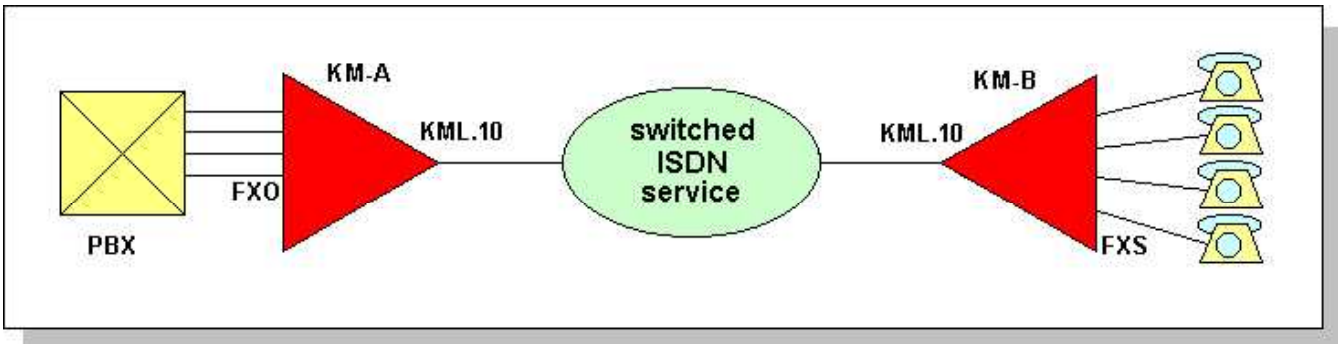


Figure G-10. Connection on Demand with Voice

Switched backup on ISDN

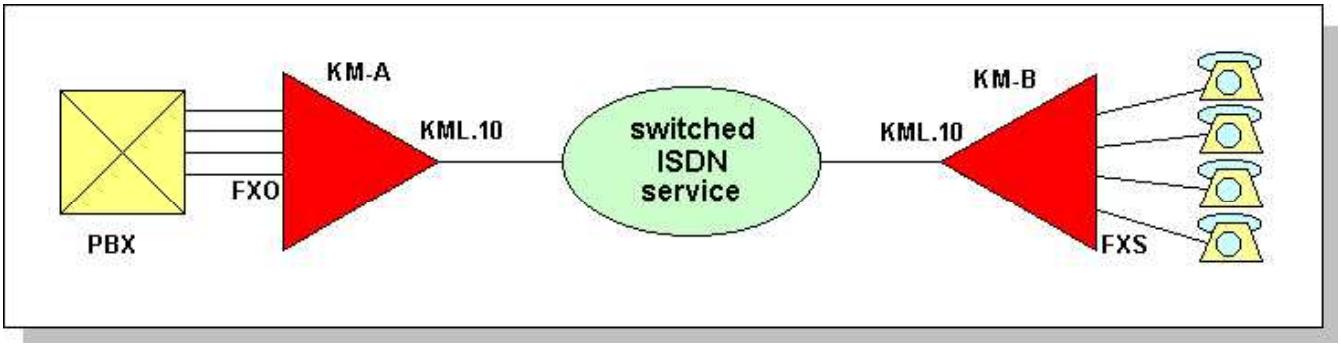


Figure G-11. Switched backup on ISDN

G.5 Advanced Point to Point Applications

Tail End Application

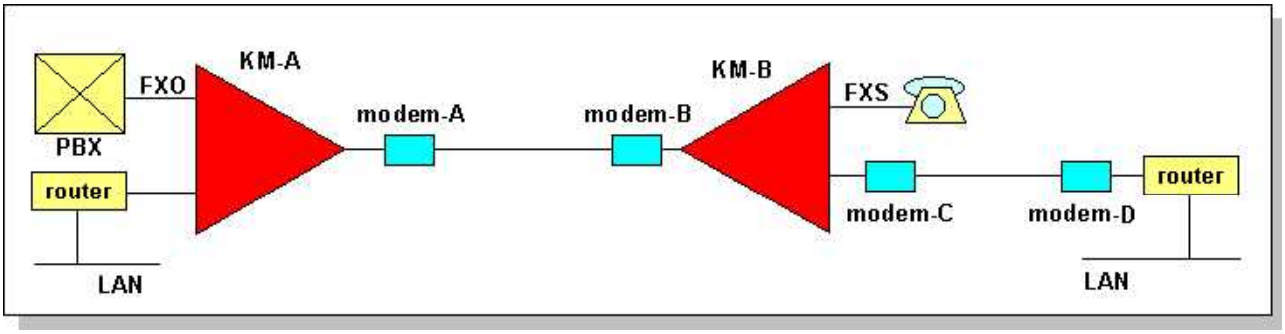


Figure G-12. Tail End Application

Tail End with DTE2 Clocking

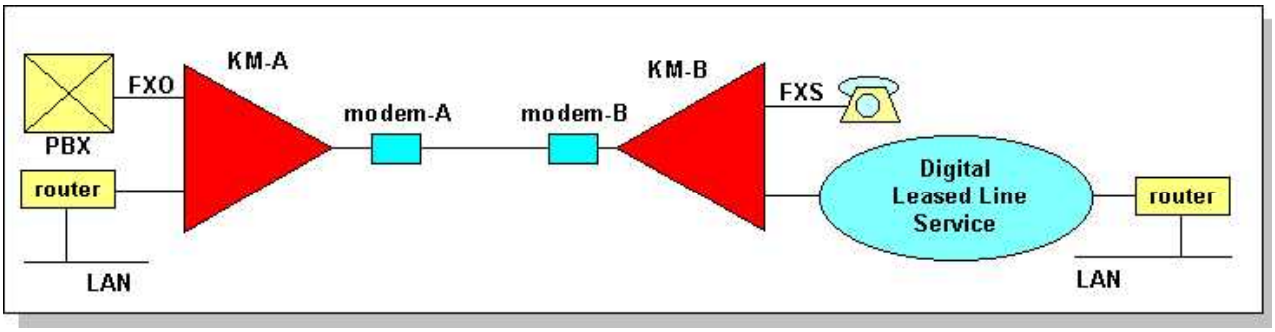


Figure G-13. Tail End with DTE2 Clocking

Back to Back with DTE2 Clocking

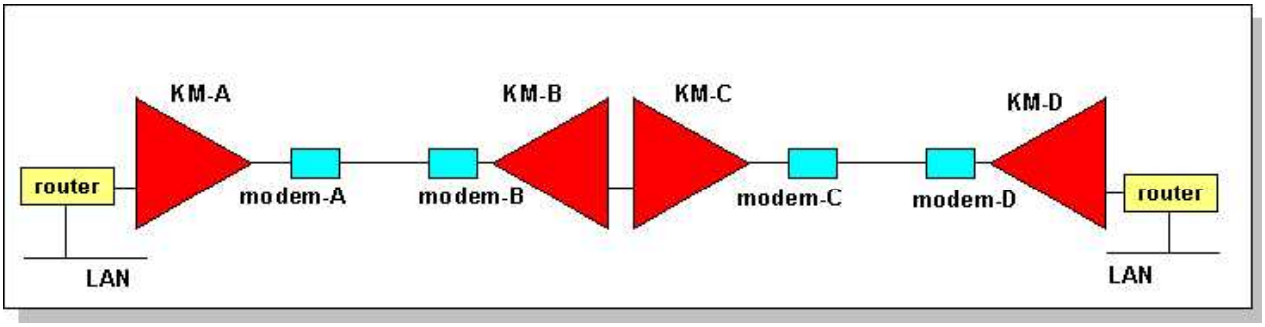


Figure G-14. Back to Back with DTE2 Clocking

LAN to LAN Connection

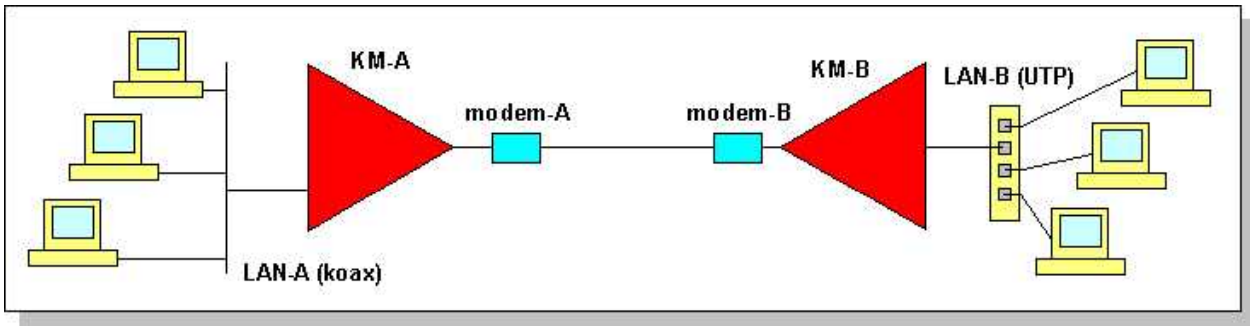


Figure G-15. LAN-to-LAN Connection

LAN Connection to External Router

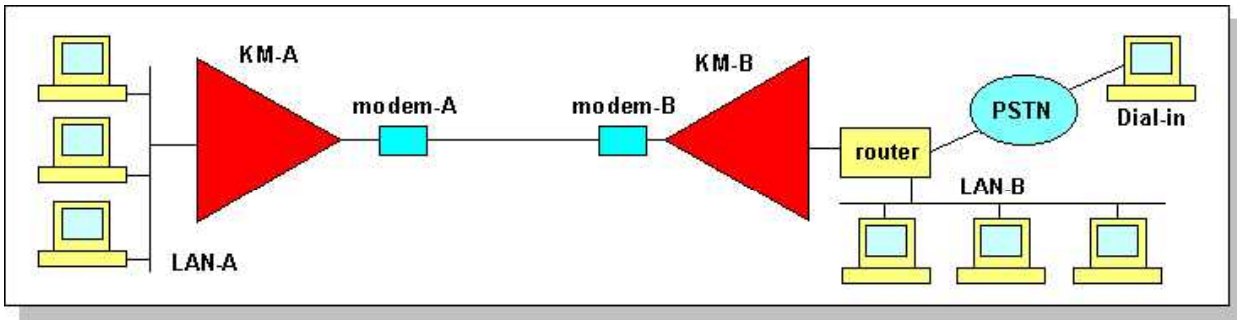


Figure G-16. LAN Connection to External Router

G.6 Dual Link Applications

V configuration

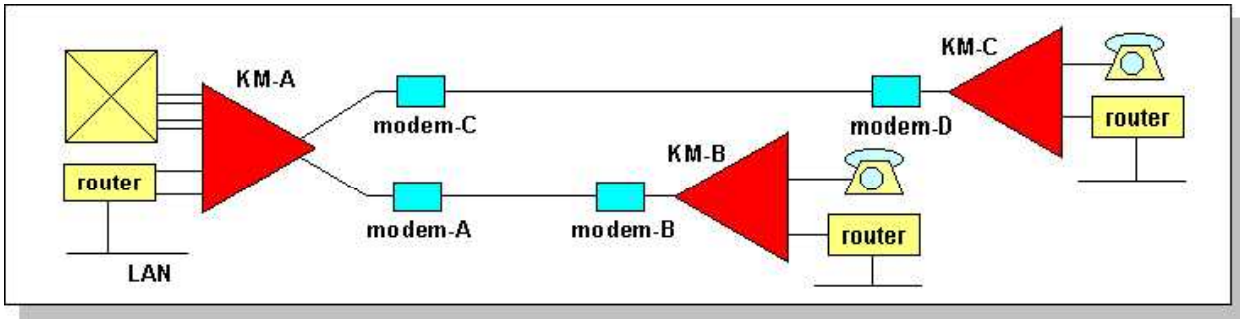


Figure G-17. V configuration

Switched Backup on Dial-Up Line

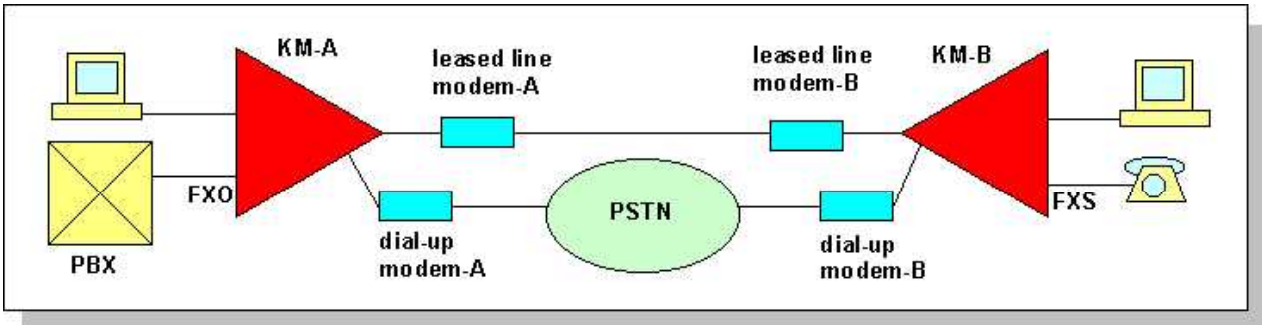


Figure G-18. Switched Backup on Dial-Up Line

Main Link Redundancy

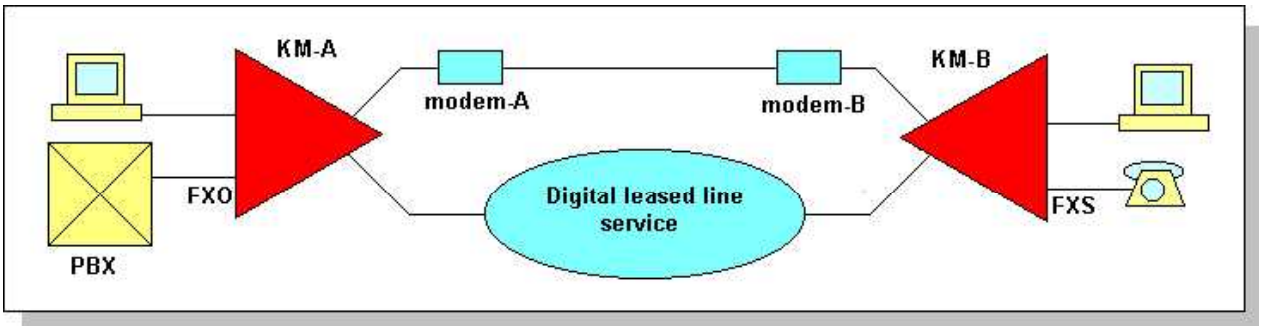


Figure G-19. Main Link Redundancy

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